American Machinist

A McGRAW-HILL PUBLICATION

September 22, 1937

Hot Wires—Even when low voltage is used, machine drive circuits are a source of danger if proper safeguards are not provided (Page 848).

MASON BRITTON
Vice-Chairman

KENNETH H. CONDIT *and* FRED H. COLVIN
Editors

JOHN HAYDOCK
Managing Editor

H. R. LE GRAND — BEN C. BROSHEER
S. ASHTON HAND

PAUL WOOTON, *Washington* — BURNHAM FINNEY, *Western Editor, Detroit*

W. E. KENNEDY
Manager

McGraw-Hill Publishing Company, Inc.

Publication office, 99-129 North Broadway, Albany, N. Y. Editorial and executive offices, 330 West 42nd Street, New York, N. Y. Branch offices: Chicago, 520 North Michigan Ave.; San Francisco, 883 Mission St.; Aldwych House, Aldwych, London, W. C. 2; Washington; Philadelphia; Cleveland; Detroit; St. Louis; Boston; Atlanta.

JAMES H. McGRAW, JR.
President

JAMES H. McGRAW, *Honorary Chairman* — MASON BRITTON, *Vice-Chairman*

HOWARD EHRLICH
Executive Vice-President

B. R. PUTNAM, *Secretary* — D. C. McGRAW, *Treasurer*

A. W. MORRISON
Circulation Manager

AMERICAN MACHINIST. Published every other Wednesday, price 35c a copy. Subscription rates—United States, Canada, Mexico, and Central and South American countries, $3.00 a year. All other countries (except Europe and British possessions in Eastern Hemisphere), $6.00 a year or 24 shillings. Entered as second class matter, September 29, 1936, at Post Office, Albany, N. Y., under the act of March 3, 1879. Printed in U. S. A. Cable address "McGrawhill, New York." Member of A.B.P. Member of A.B.C. McGraw-Hill Publishing Co., Aldwych House, Aldwych, London, W. C. 2, England will serve with the European edition, all subscribers in Europe and British possessions in Eastern Hemisphere—subscription rate 35 shillings for one year.

Volume 81 — Number 19

Copyright, 1937 by McGraw-Hill Publishing Co., Inc.

MAJOR ARTICLES

Mechanization Pays the Worker ..... *Paul G. Hoffman* 830
Germany's Automotive Industry ..... *John Haydock* 834
Press-Tool Storage ..... *John J. McHenry* 836
Out of the Basement 838
Training for Skill and Initiative ..... *H. R. Le Grand* 839
Fabricated Truck Pedestals ..... *Frank C. Hudson* 841
Practical Pin Measurement ..... *John Apelskog* 842
Good Jib Cranes and Bad ..... *C. C. Hermann* 846
Danger Lurks in Low-Voltage Circuits ..... *J. Rosevear* 848
Auxiliary Vise Jaws for Milling Operations ..... *C. W. Hinman* 852

SHORT ARTICLES

Inspecting Push Rods Automatically 833
Housing Workmen 840
Locked Up Stresses—A Fallacy ..... *C. J. Holslag* 847
Capital Goods and American Progress 874
How Long Is the Blank ..... *E. J. Sampson* 879
What Do the Workers Think? ..... *A. W. Forbes* 879

PRACTICAL LETTERS

Cylinder Facing Rig ..... *Clifford H. French* 855
Adjustable Centering Bar ..... *H. L. Wheeler* 855
Blind Contour Boring ..... *E. L. Candler* 855
Protecting Tools From Rust ..... *C. A. Mowrey* 856
Auxiliary Faceplate ..... *H. Moore* 856
"Barrel" Drift Pin Enlarges Tubing ..... *J. J. Hill* 856
Taking Up Spindle Wear in a Drill Press ..... *George H. Cooper* 857
Inside Micrometer ..... *J. R. Whittles* 857
Grinding Drills for Plastic Compounds ..... *Charles H. Willey* 857
Preventing Coolant From Splashing ..... *J. Homewood* 857
Attaching Shell Reamers to Their Bars ..... *W. M. Halliday* 857
Universal Gage for Center Distances of Holes ..... *George J. Belbes* 858
Keyseat Miller for Valve Motions ..... *Chester H. Franklin* 858

DEPARTMENTS

Editorials 829
Talking Shop 845
Round Table 850
Reference Book Sheet 859
Industrial Review 860a
News 860b
Detroit Letter 860c
Watching Washington 860e
New Books 880
Trade Publications 880

Next Issue...

ALL ABOUT THE NATIONAL METAL SHOW

Don't miss this detailed preview of the National Metal Congress and Exposition, opening in Atlantic City, October 18 . . . biggest event of the year in metals and metal treatment.

The entire issue is devoted to the Show . . . will tell you all about it (program of meetings, list of exhibitors, etc.) and will describe the most important new developments being presented.

Many exhibitors have reserved extra advertising space in this issue to present the details of products that they are featuring.

If you are planning to go to the Show, you can select from this issue the exhibits you "must see." If you cannot go, it provides the next best thing . . . *the Show in print.*

Coming October 6

NATIONAL METAL SHOW NUMBER

EDITORIAL

Between Sessions

UNLESS Mr. Roosevelt decides to convene Congress in a special session to approve certain New Deal measures that were avoided or evaded or plainly ignored at the last session the members will be among their constituents for nearly four months. It is up to the constituents to use these months to advantage in making their wishes known to their elected representatives.

What happened in the last session is a clear indication that many members have taken off their rubber stamp overshoes and are prepared to stand in their own shoes as responsible factors in government. The defeat of the court-packing bill and the suffocation of the wages-and-hours measure were significant of the changed attitude.

While members are in a mood to assert their independence is a good time for business men and manufacturers to present the reasons why certain ill-considered laws should be reconsidered and amended at the next session before they do any more harm. And there is no reason why men who are not at the head of large or small companies, but who are convinced of the harm that these laws will do them, should not find an occasion for telling their Congressmen what is on their minds. Works managers, superintendents, department chiefs are as much concerned with laws that stifle business as their employers are. Each one of them, as a voter, is just as important to an elected representative as any other voter is.

There are plenty of bad laws on the books that are harming the metal-working industry. Whether or not they were written and passed with the best intentions in the world is of no moment. The fact that they are not working satisfactorily is enough to condemn them.

EVERY READER of American Machinist doubtless has his own list of pet aversions among New Deal laws. For our part we commend for revision or repeal the Surplus Tax Law, the Wagner Labor Relations Act, the Walsh-Healy Act, the fund provisions of the Social Security Act, and the ten per cent profit limit of the Vinson Act. There are plenty more but these will do for a start.

The time is all too short, and may be shorter if a special session is called. Make the most of it.

Mechanization Pays the Worker

From a production of $1550 worth of product a year and a wage rate of 16 cents an hour in 1870 to $9175 and 87 cents an hour in 1936

PAUL G. HOFFMAN
President, Studebaker Corporation

STUDEBAKER is the only manufacturer of carriages and wagons which successfully made the transition into the motor car field. In making that transition, it has faced all the problems that came in the wake of the rapid technological advance which has taken place in America since the turn of the century. Materials, machinery and men have all felt the full impact of that advance. At one time we were workers in wood; now we work with steel. Machinery, at the beginning of that period, was an adjunct to a great force of hand workers. Today, our workers guide machines.

To hold its place in the sun, Studebaker has become a part of what is called the machine age. Certain authors, lecturers, economists

Fig. 1—South Bend, 1870

Fig. 8—South Bend, 1937

Fig. 3—Studebaker Workers, 1870

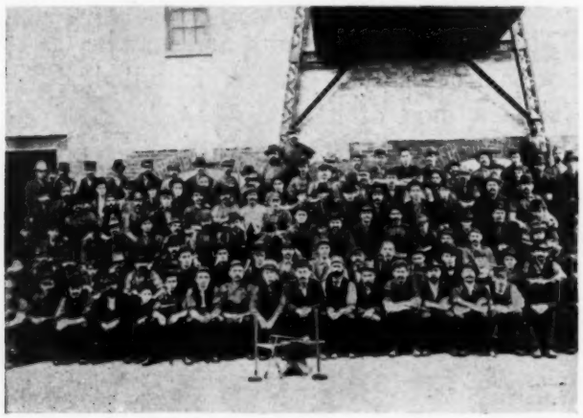


Fig. 2—Studebaker Plant, 1870

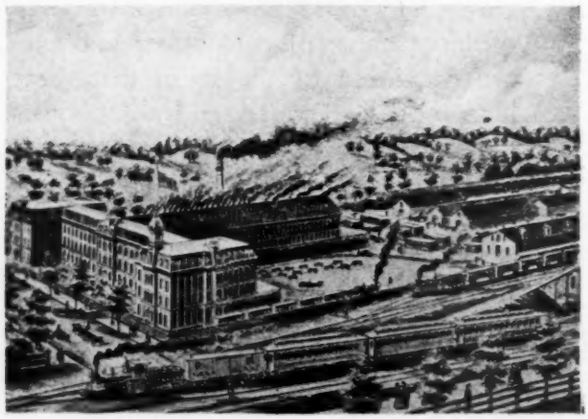


Fig. 5—Fire Brigade, 1870

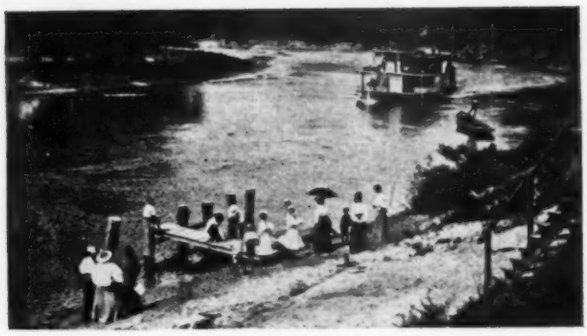


Fig. 6—Real Excitement, 1870

and theorists have condemned the machine age in vigorous terms, claiming that it has decreased employment, has marked the demise of skill and craftsmanship, and has generally made the life of the workingman unhappy and unpleasant.

Perhaps Studebaker, because its history overlaps the whole transitional period, is in a unique position to challenge the validity of these assertions. That can be done by facts and figures as to the number of employees, their wages and hours of work per week, the investment in plant and equipment, and annual sales for the years of 1870, 1908 and 1936. These facts and figures will clearly demonstrate that in order to provide a more abundant life for the workingman it is necessary to make a substantial investment in machinery; that hand labor alone can at best produce only subsistence wages. The year 1908 was chosen because just following that year Studebaker started on its program of mechanizing its plants.

In addition to the facts and figures, I will present testimony secured from men now living, as to the social aspect of the workingman's life in the respective years which have been chosen.

First of all, let's look at the town of South Bend in 1870. Studebaker had been in business eighteen years when this picture, Fig. 1, was made.

The Studebaker factory, Fig. 2, represented an investment in buildings and equipment of $64,175. There were three hundred people employed so that each employee had behind him an investment of $217 in plant and equipment. The total sales volume for that year was $566,000, or $1,550 worth of sales per employee.

A typical craftsman who worked for Studebaker in 1870 received a total of $465 in wages. He worked

Fig. 4—Worker's Home, 1870

Fig. 10—Worker's Home, 1937

Fig. 7—Studebaker Plant, 1908

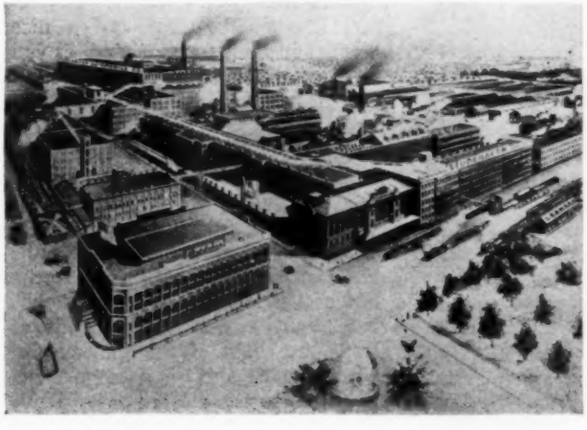


Fig. 9—Studebaker Plant, 1937

sixty hours a week with no vacations or Saturdays off. On an hourly basis that approximates 16¢. Figured in terms of purchasing power, that would be equivalent to about 30¢ per hour today. Even that seems low, but remember that the dollar volume of sales per employee was only $1,550. Fig. 3 shows a typical group of Studebaker workmen in 1870. Note the blacksmith's tongs and sledges.

A worker's house in 1870 looked like Fig. 4. The water came from a pump in the back yard; the bath tub was a wash tub on the kitchen floor; and the plumbing was of the Chic Sale variety. Kerosene lamps gave what little light was needed, but that was not very much because everybody went to bed early. In addition to working sixty hours in the plant, there were household chores as well. The head of the house bought live pigs, butchered them himself, rendered the lard, smoked the meat and put it away for the winter.

1870 Social Life

Social life centered around the volunteer fire brigades, of which every factory had one or more, Fig. 5. The employees left their work at the first sound of the factory whistle, rushed to their hand-made hose carts, grabbed their helmets and fought the fire—a much greater menace than today. They had occasional dances on Saturday nights, and on holidays different teams would race to see which could go the fastest over a certain distance, take the hose off the reel, and start a good-sized stream on an imaginary blaze. Studebaker's team was usually the winner, for, naturally enough, they had the best cart.

When people wanted real excitement, they took the old ferry boat, May Graham, up the St. Joseph River, Fig. 6.

Now let's jump to 1908 and see what the Studebaker plant looked like at that date, Fig. 7. I ask you to recall that Studebaker was one of the world's foremost manufacturers of carriages, wagons and harness. The plants had a value of $5,645,944, a large investment but practically all of it was in buildings and workmen's benches. Very little machinery had been installed. There were 3,000 employees, so that each employee had behind him an investment of $1,882. The total sales volume for the year was $5,959,790, more than ten times that of 1870, but production was still dependent upon hand labor. As a consequence, the annual sales volume per employee was only $1,986 as against $1,550 in 1870.

A typical craftsman earned $624. He still worked sixty hours a week with no vacations or Saturdays off. On an hourly basis that was approximately 20¢. That doesn't represent any substantial increase over 1870. In fact, living costs had gone up sufficiently so that there was little increase, if any, in purchasing power. Studebaker, however, was paying every cent it could afford to pay, because I ask you to recall that the annual sales per employee were only $1,986, and out of that amount had to come all material cost, selling expense, the overheads of various kinds. Studebaker's profit per employee in 1908 was small indeed.

There would be no point to showing a picture of his home or details of his social life because there was little change from 1870. There were electric lights and running water, but his life consisted of work in the plant and household chores and little else.

Now the story changes. I want to bring you up to date and show you the sharp contrast between 1908 and 1937. Here is South Bend today, Fig. 8.

Here is the Studebaker plant of today, Fig. 9. The original cost of this plant was more than $40,000,000, although it is carried on our books today at $13,515,600. As a matter of fact, between 1908 and 1937 more than $30,000,000 was invested in machinery and mechanical equipment alone. There are 7,337 workers in the plant, and sales for 1936 were $68,928,724. That means the dollar volume of sales per man was $9,175.

Here is one of the latest recruits of the Studebaker working force, Fig. 10. He is twenty-two years old; was born in South Bend; has been employed for one year as a spot-welder of The Studebaker Corporation. He receives approximately $1.00 per hour for a forty-hour week. Two months ago he was married to a South Bend girl and they went to housekeeping in a three-room and bath apartment. Here you see them in a corner of their living room. Note the radio, electric clock and the comfortable, modern furniture.

He bought furniture for this apartment from his savings and pays $35 a month rent. He drives a 1932 Studebaker. There is a modern ice-box in the apartment and a nice laundry in the basement, and, as you see, the whole arrangement is light and airy. He and his wife eat in the kitchen most of the time but occasionally spread the gateleg table in the living room and eat in style.

1937 Amusements

There is no volunteer fire brigade, but Mr. Lambert does belong to the Studebaker Athletic Club. He bowls one night a week and spends at least one night at the movies. On week-ends he and his wife go dancing or to parties at the houses of his

We make this statement with positive convictions as far as Studebaker is concerned: The machine has not enslaved men—it has freed them; it has not created unemployment—it has added to our employment; it has not made robots of workingmen, but, on the contrary, it has made them better, more enlightened citizens who take, if anything, a greater prde in their workmanship than did the craftsmen of 1870

Period	*Employees*	*Yearly Wage*	*Hours Per Week*	*Hourly Rate*	*Annual Sales*	*Sales Per Man*
1870	300	$465	60	16¢	$566,000	$1,550
1908	3,000	$624	60	20¢	$5,959,790	$1,986
1936	7,337	$1,698	40	87¢	$68,928,724	$9,175

Fig. 11—Cooperative Earnings, Production and Investment, 1870, 1908, 1936

friends. He and his wife have both been to New York and Chicago and are up and coming citizens of South Bend.

This barrage of figures must be rather confusing. I'll try to make the picture somewhat clearer by bringing them together on one chart, see Fig. 11.

The chart almost tells its own story. The Studebaker business expanded rapidly from 1870 to 1908, but there was little or no mechanization in the plant. There was a steady increase in employment, to be sure, but wages and hours of work remained almost stationary, for the simple reason that the dollar volume of sales per employee remained almost stationary. Mechanization commenced in 1909 and has continued at an accelerated pace ever since. Studebaker has taken advantage of every technological advancement. By 1936 the annual output per man with the aid of machinery was $9,175 as against $1,986 in 1908. The working force was more than doubled in this period. In 1936 the average Studebaker workman worked forty-eight weeks of forty hours each at an hourly wage of 87¢ per hour. He received $1,698 for his 1920 hours of work. Contrast this with the $624 received by the workman in 1908 for his 3,120 hours of work.

We make this statement with positive convictions as far as Studebaker is concerned: The machine has not enslaved men—it has freed them; it has not created unemployment—it has added to our employment; it has not made robots of workingmen, but, on the contrary, it has made them better, more enlightened citizens who take, if anything, a greater pride in their workmanship than did the craftsmen of 1870.

From an address delivered at South Bend, August 23, 1937.

Inspecting Push Rods Automatically

A machine at Ford's Rouge plant separates them into seven groups

A NEW automatic machine which performs 11 distinct inspection operations so rapidly that 42 valve push rods are tested each minute has recently been placed in service at the Rouge plant of the Ford Motor Company. The machine, which utilizes photo-electric cells and radio amplification to do its work, inspects valve push rods for hardness, hidden fissures and accuracy of dimension.

Push rods feed through a narrow slot into one end of the testing machine and are carried upright through two inspections, then are turned 90 deg. to a horizontal position for remaining operations. The push rods are checked for hardness first. An automatic scleroscope works in connection with an "electric eye." A diamond-tipped weight drops on the push rod. If the hardness is correct, the weight rebounds to a predetermined height, intercepts a light beam and the electric eye actuates a mechanism that passes the push rod. Push rods that are not hard enough are rejected and thrown aside.

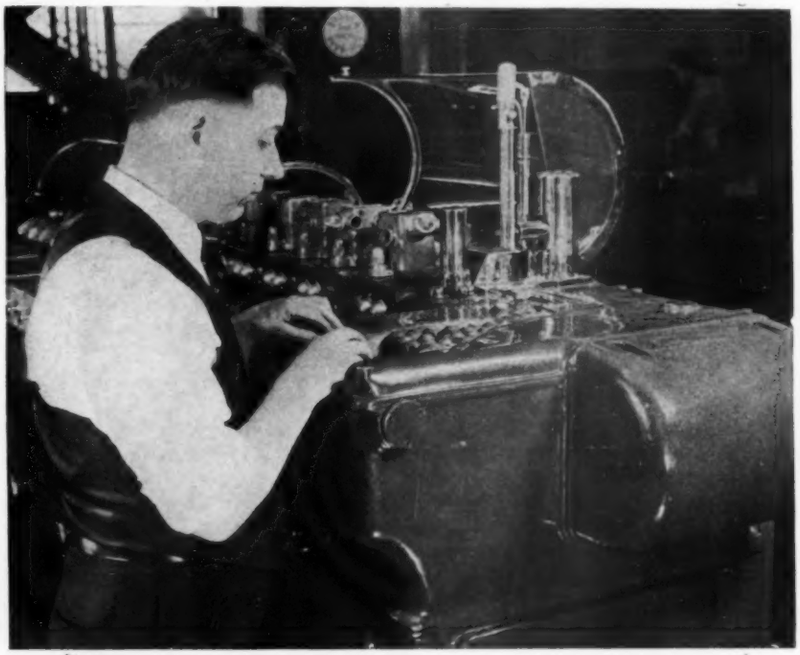
A hammer strikes the side of the push rod in the second operation. By "listening" to the pitch and duration of the resulting sound, the machine determines instantly whether the push rod structure is without defect. A hidden fissure will curtail the period of sound vibration. A microphone and amplifier are part of the inspection mechanism at this test station.

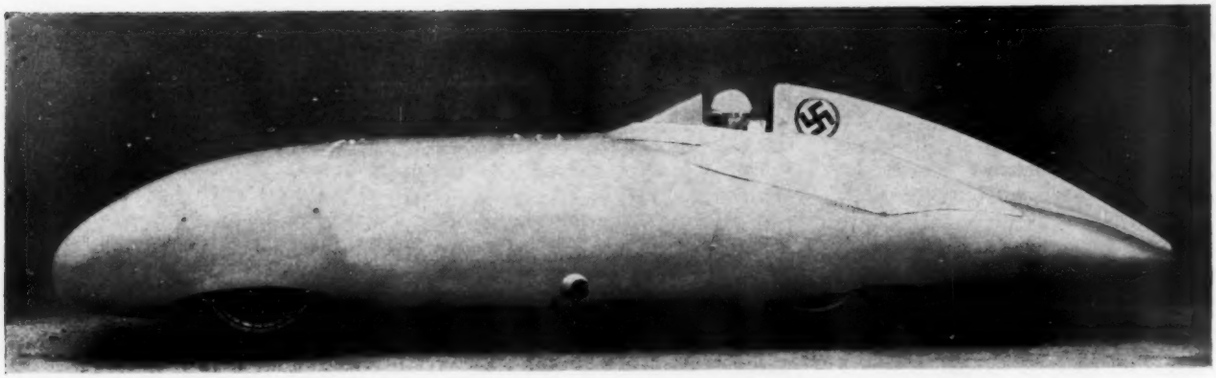
Nine other inspection operations follow to ascertain accuracy of manufacture. The first is for squareness of the bottom face of the push rod. The allowable tolerance here is 0.001 in. Next the part is measured for roundness, with variation held within 0.0003 in. Squareness of the top is gaged to within 0.0005 in. Automatic fingers then enter the slots in the sides of the push rod to check for minimum wall thickness. Two steps gage the diameter, first at the center and then at both ends, within limits of 0.0005 in.

In the final three sections the parts are measured for length and sorted automatically into seven groups, with only 0.001 in. variation between groups. The seven groups are classified and stacked in boxes as follows:

(1) Undersize push rods below allowable limit and scrapped
(2) Under standard size 0.002 in.
(3) Under standard size 0.001 in.
(4) Standard or mean length
(5) Over standard 0.001 in.
(6) Over standard 0.002 in.
(7) Over allowable limit and reground

Around 85 per cent of Ford push rods run to the standard or mean length, a commendable result.





Popular interest in automobile racing is such that high-powered special models add greatly to the manufacturer's prestige

Germany's Auto Industry

New highways and lower production costs point to an advancing automobile market within the Reich

JOHN HAYDOCK
Managing Editor

IN GERMANY there is one motor vehicle for every 49 persons as compared to one for every 4.5 persons in the United States and one for every 20 persons in England. Despite the relatively smaller number of automobile owners in Germany, interest in automobile design and construction is nowhere more intense.

This was very evident at the Berlin Motor Show held February 20 to March 7, 1937. The doors were open every day during this two-week period but the large area covered by the exhibition buildings was still extremely crowded. On the last Sunday of the show, the doors had to be closed seven times to exclude new visitors until some of those inside had left. Altogether over 1,000,000 persons attended.

In the building devoted to passenger cars, exhibition spaces were divided by straight lines reaching from a wide center aisle to rows of columns at either side of the center bay. Above each company's exhibit the name or trademark of the manufacturer was prominently shown. The spaces were not separated, so it was possible to walk from one booth to another without returning to any of the aisles.

This hall was connected with others in which were displayed buses, trucks, motor cycles, bicycles and accessories. Altogether, some five buildings were devoted to the show—all interconnected by passage ways. A new building larger than any of the others is now in the process of construction.

The site of the Berlin exhibition grounds is dominated by the Funk Turm, formerly a radio broadcasting tower, now used as a beacon. A restaurant built half way up this tower provides a striking view of the city of Berlin.

Standardization Lacking

A note of contrast, between this exhibit and similar shows held in the United States, was the great diversity in design. This diversity existed not only between makers but even in the line of a single manufacturer. For instance, most manufacturers using rear engine designs also show models with the engines in the front. The lack of standardization is even more noticeable in commercial vehicles where the tendency to experiment goes to great lengths. While these varied designs show originality, there is no question that they tend to raise the price of the German automobile to the consumer. This condition is recognized by the government and the production of a Volkswagen, or people's car, has been incorporated in the Four-Year Plan of German industrial development. The purpose of such a development is to make automobiling available to large numbers of the people who cannot afford automobiles at present prices. It is believed that a lower priced car will have a salutary effect in increasing the ratio between number of automobiles and population in Germany.

An important part of the automobile program is the development of a highway system throughout Germany. At the close of 1936, 1,100 miles of the Reichsautobahn had been completed. The Autobahn is a superhighway 25 meters wide. Two concrete roadways are separated in the center by a strip of ground in which shrubs are being planted to hide the glare of oncoming headlights. An additional 1,500 kilometers is at present under construction, and 1,700 more kilometers are planned. The present program is to complete 1,000 kilometers a year.

Automobile racing seems to have a strong hold on the German imagination and accounts in a large degree for the success of German drivers in international competition. On July 6 the Vanderbilt Cup Race was won by Bernd Rosemeyer driving a rear-engined Auto Union car. Richard

Seaman was second in a German built Mercedes-Benz

In the United States the building of racing automobiles has long been separated in the popular mind from the business of building stock passenger cars. In Germany, however, the ability to construct fast special cars still adds to the prestige of the manufacturer.

The ace of German automobiles and official car of most of the government officials is the Mercedes built by Daimler-Benz. This company operates five plants, the chief of which is located at Untertürkheim which is just across the Neckar River from the city of Stuttgart. This plant presents a picture of custom car manufacture involving a high percentage of hand labor which is gradually yielding to the pressure for mechanization. The Mercedes is primarily a quality car and is built in sizes up to 7.5 liters which is a big car in any country and especially large for Germany which, because of the high fuel cost, runs to small automobiles.

German cars are in general divided into four classes according to displacement: 1 liter, 1½ liter, 2 liters, and 2½ liters and above. Production in Germany is about evenly divided between the three smaller classes with only about five per cent in the large car class.

Mercedes recently went into the small car field with a 1.7 liter car. The larger sizes involve a great deal of special work and are not built on a mass production basis. There are, however, assembly lines which consist of dollies drawn along on a cable. Since the movement of these lines is only about five meters an hour, it can scarcely be detected even when watched closely. Gears for the Mercedes cars are ground on large batteries of Maag gear grinders.

At the Sindelfingen plant, the Daimler-Benz Company builds its bodies. This unit is located about fifteen miles from Untertürkheim and occupies buildings built in war time for aircraft manufacture. In the production of the bodies, handwork is even more prominent than in the manufacture of motor and chassis. A great deal of attention is paid to buffing and polishing to secure a fine finish on the completed body. Coach work is entirely of wood. Many colorful and expensive leathers are used in the upholstery.

As a contrast to the Daimler-Benz custom production, the Adam Opel plant at Rüsselsheim presents a picture of production methods having their origin in America. This plant is under the management of General Motors and builds four lines of cars. The lowest priced Opel, which lists at about 1500 Reichsmarks, is the cheapest German-built car. Working in the opposite direction from Daimler-Benz, this year Opel has entered the larger car field with its Admiral model having a displacement of 3.6 liters and costing about 4,500 RM.

When American mass production methods are mentioned it must be remembered that they must be tempered in accordance with the quantities handled. During the year 1936, the total German production of passenger cars was only a little over 240,000 as compared to approximately 3,800,000 in the United States. Therefore, despite its position as the largest single manufacturer of automobiles in Germany, the Opel plant must necessarily adapt its methods to the volume of production. The plant showed a progressive attitude in keeping equipment up to date and in using modern methods.

Assembly Line Elevated

Opel cars are built with the bodies and chassis fabricated as one unit. For the purpose of assembling the axles, the conveyor line is run at a high level in order to avoid the use of pits. After the work on the undercarriage has been completed, the conveyor comes down to floor level to complete the operations in the conventional manner.

Most of the machine tools used at Rüsselsheim are either German or American with a scattering of plant-made units.

The heat-treating department reflected the same progressive management as the rest of the plant. Transmission gears are pack-hardened while small parts are gas-hardened in continuous furnaces.

As mentioned in a previous article, one of the problems of manufacture in Germany is to secure sufficient supplies of raw materials. In the automotive field the supply of steel is limited by the fact that there are no continuous hot or cold mills in Germany. This lack naturally makes prices high.

Everyone connected with the German automobile industry expresses great confidence in the future market there. It is admitted that it will be a great many years before the number of cars to population will approach anything like that in the United States, but a ratio similar to that now prevailing in England is considered likely in the course of the next few years. Even the achievement of England's present ratio of motor cars would be stepping up Germany's consumption of automobiles two and a half times. Big as this jump may seem, the widespread popular interest in the automobile indicates that it will be feasible as soon as the purchasing power of the German people can absorb the additional volume.

Progressive assembly forms a compromise with custom methods at the Untertürkheim plant of Daimler-Benz

Press-Tool Storage

A master card lists all the operations on the part, and subsidiary cards give the bin numbers for the tools involved

JOHN J. McHENRY

ADEQUATE SPACE for storing press tools seldom exists, especially in plants catering to yearly or semi-yearly models. Carrying tools for obsolete models and continuous development and making of new tools necessitates carefully planned storage bins that are easily accessible and are so arranged that identification symbols can be easily traced.

A ladder running on an overhead rail for handling the lighter tools in and out of the upper bins, and an elevating platform truck for heavier tools in the lower bins are great conveniences. The heaviest tools and the bolsters can be stored on the floor under the bottom bins, and the floor at that point should be covered with sheet metal for ease in sliding the tools in or out. The quantity and the size of the bins should suit the individual requirements, and either the rows or the sections may be identified by letters of the alphabet, as in Fig. 1, each individual bin being numbered.

Proved by Practice

Of the many systems for marking the identification of part and operation on the tools, I believe the part number and the symbol to be the most practicable. It involves less marking on the tools, less writing on record cards with no confusion of part names or operations, and has been tested and proved by years of practice. However, individual preference will be influenced largely by the type of marking already on the tools. As an example, assume that we have a drawn shell known as Filter Case, Part No. 10,002 that requires five operations. The marking may be either:

Blank and draw part 10,002;
First redraw part 10,002;
Second redraw part 10,002;
Trim and pierce part 10,002;
Pierce 5 radial holes in part 10,-002.

Or it may be:

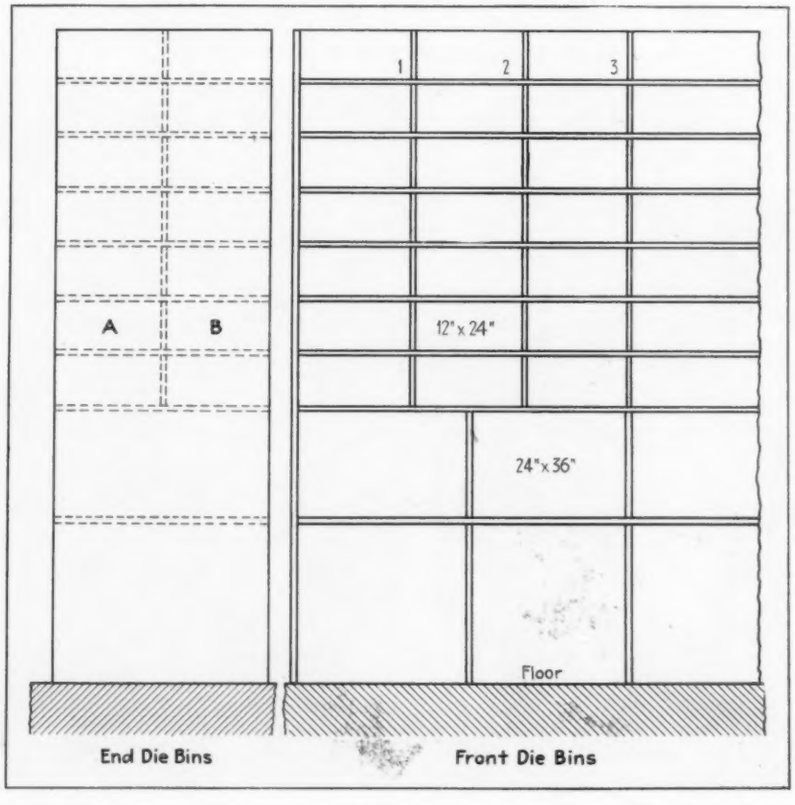
10,002—1;
10,002—2;
10,002—3;
10,002—4;
10,002—5.

The information is just as definite in the second instance as in the first and is certainly much to be preferred for simplicity and for marking the tools. Assuming that the tools are to be so marked that they can be identified as to their functions in relation to a certain part, it is then essential to assign them to bins, mark them, and record the markings in such manner that they can be located at once.

For the purpose of showing the elasticity of the system, assume that the punch part of the blank and draw tools is assigned to Bin A-112 and the die part to Bin B-6. The marking on the punch part is 10,-002—1, Bin A-112, and on the die part 10,002—1, Bin B-6.

To show that more than one set of tools can be in the same bin, assume that the tools for the next two

Fig. 1—Bins of these types and sizes have given satisfactory service



operations are assigned to Bin A-12. The second-operation tools are then marked 10,002—2, Bin A-12, and the tools for the third operation are marked 10,002—3, Bin A-12.

While the grouping of all tools required for a certain part might be of a little advantage, it is of no great importance. To call attention to this fact we will assign the tools for the fourth operation to Bin R-107, and both the punch and the die parts are marked 10,002—4, Bin R-107.

All the tools having been marked, the record cards are made in sets consisting of a master card and as many individual cards as there are operations to be performed by the tools. The master card for the tools referred to is shown in Fig. 2. It has a tab for the part number for filing as well as for job identification. Instruction cards for each operation are made out as shown in Fig. 3. This system was developed years ago in a large lamp manufactory and has since been introduced in other factories with very satisfactory results. The savings by its use have been considerable, and the record work has been simplified.

What to Watch

There are certain minor difficulties to be met, such as: Case I, using interchangeable parts on the same die-shoe; Case II, using the same die for two or more different part numbers; Case III, using old die-shoes salvaged from obsolete parts. While these instances should not be termed difficulties, occasionally, where supervision has eased up a little, one or the other might get by and cause trouble.

The practice of using interchangeable parts in a die, as in Case I, may not meet with the approval of many, but the intensive study of safety devices and safety operated press tools in the last few years has been responsible for the development of substantial mechanical press-tool actions at extraordinary cost, where in the piercing, notching or other component tool part costs are minor.

To build these units for small production would be prohibitive were it not for the ease of interchanging the actual die parts. Thus we have the condition of interchangeable parts in the same die-shoe. The identification of these parts is made by marking each individual loose part with the part number for which it is intended, and also with the bin number of the die-shoe in which it functions. To

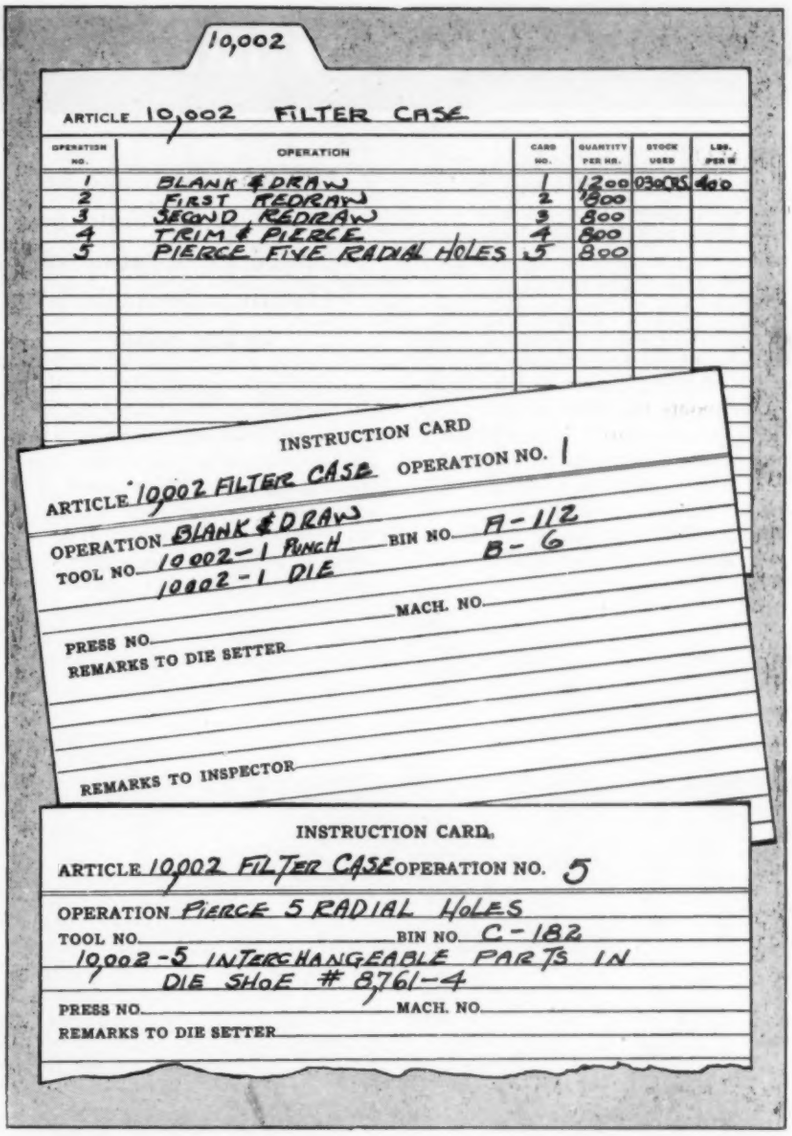


Fig. 2—Job number is written on the tab of the master card, and below are the name of the part, the operations and the subsidiary instruction card numbers. Fig. 3—Instruction cards for each operation list the location of the tools. Fig. 4—This card shows that for the fifth operation there are interchangeable parts for the die, and that these must be secured from another die shoe

illustrate this procedure, see instruction card No. 5 in Fig. 4, pertaining to Filter Case Part 10,002. The record of interchangeable parts is shown as belonging to another die-shoe.

Case II, using the same die for two or more different part numbers, requires only the writing of information clearly on the die card with the number and bin of the die.

Remove Old Number

Using old die-shoes salvaged from tools for other parts, Case III, can cause considerable trouble. It is not uncommon to build and mount a new die on a die-shoe salvaged from obsolete tools and permit the die to get in the press room. If the old bin number, previously used, has not been removed from the die-shoe, or corrections made on the record cards to cover the matter, someone in the press room may see this die lying on the die bench and put it away in the bin according to the old number. The die will now be "lost" and will cause hunting throughout the bins until it is found. It is therefore very essential that the old numbers be removed from salvaged die-shoes before mounting new dies thereon. This cannot be insisted on too much in the interest of economical operation.

OUT OF THE BASEMENT

IN MANY plants the locker room is fitted into space that is left over after the rest of the departments have been provided for. This often means that the facilities the workmen use to store their clothing and to clean up after the day's work is done are found in the basement or some such out-of-the-way location.

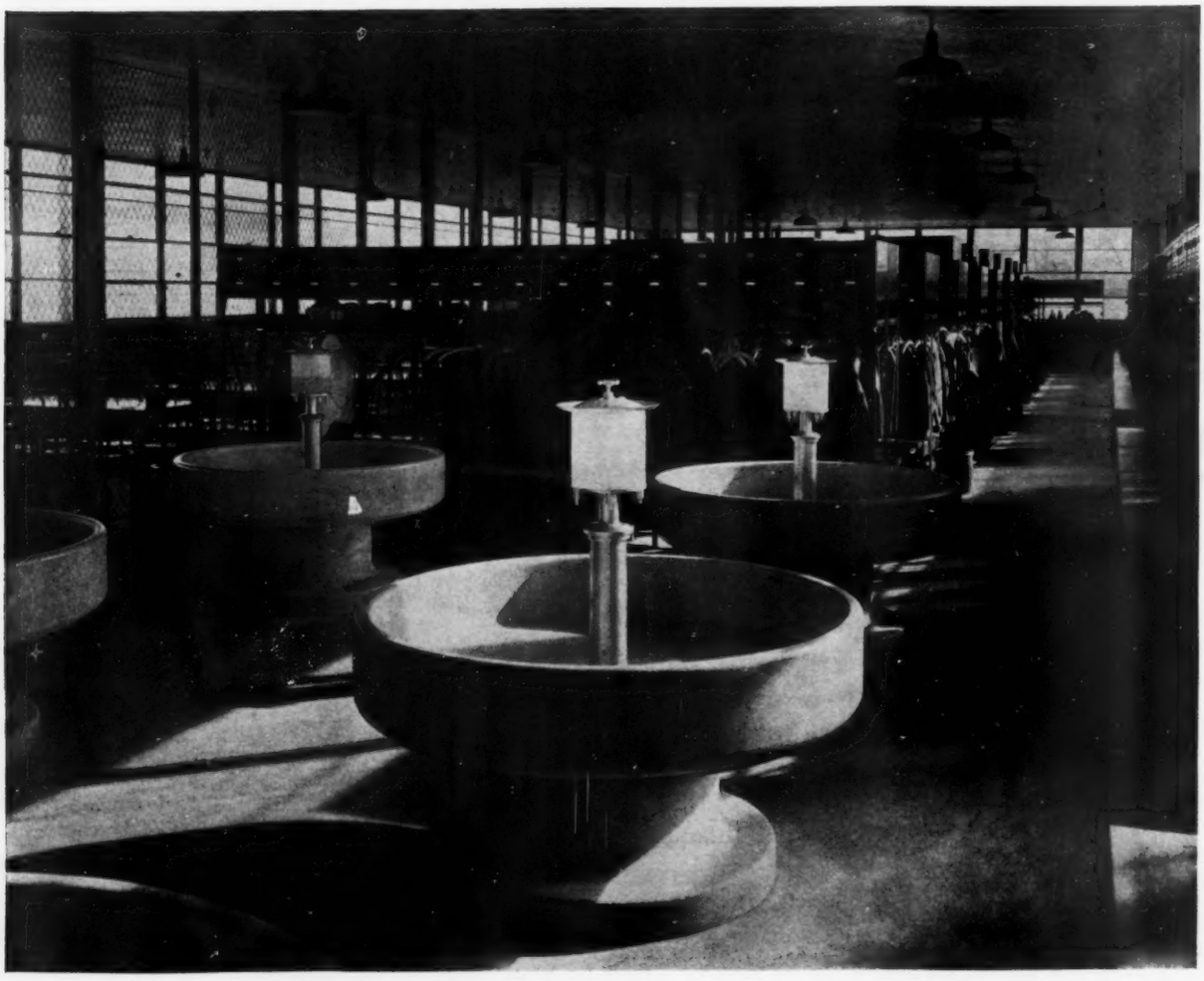
An entirely different provision for locker rooms has been made by the Hamilton Standard Propeller Division of the United Aircraft Corporation. The lockers and washing facilities are located on the third floor of a three-story building where maximum light and air are available. The lockers themselves are relatively small compartments holding only a man's personal belongings and his lunch, if he chooses to carry his noonday meal to work with him. Each compartment is provided with a lock and key.

Not where it would fit but where it should go decided the location of Hamilton Propeller's locker room

His hat, coat and shoes are stored beneath the locker on shelves especially designed for this purpose. The arrangement is such that everything is supported about one foot from the floor to permit cleaning free from obstructions. The lockers themselves may be arranged in single, double or even triple rows if the working force requires such arrangement. Parallel to the lockers and clothes racks are benches to aid the men in getting into and out of their working clothes.

The wash basins are of the circular, sanitary type which can be used by a number of men simultaneously in a minimum of space. Not shown in the picture but adjacent to these basins are the shower stalls which provide sanitary bathing facilities. The entire set-up is inclosed with wire mesh partitions which are kept locked except when this section is actually in use. Outside this partition may be seen tables which are available for use by the men who prefer to bring their own lunches. In addition, the company has a cafeteria which may be used by those who buy their lunches on the premises. The effective arrangements of lighting fixtures and sprinkler heads speak for themselves.

A modern locker room is located where maximum light and air are available



Training for Skill and Initiative

Hand-picked boys trained in a cooperative high school will provide the designers, supervisors and machine erectors of the future

H. R. LE GRAND, *Assistant Editor,* American Machinist

GETTING STARTED RIGHT—Boys selected for cooperative high-school training are given careful guidance by the plant executives. From right to left—Roger L. Putnam, president, Package Machinery Company, Paul Langhammer, superintendent, and Luther Tise a student being trained

PROGRESSIVE New England manufacturers realize that what they have to sell is primarily the traditional skill of the Yankee craftsman. Industries requiring a lesser degree of skill have moved away to be closer to their primary markets, but the region remains famous for its precision tools and machines, textiles, rugs, shoes and numerous other quality products.

Some means must be devised for training men with the requisite skill and initiative if such products are to maintain their place in American and foreign markets. For twenty years the Commonwealth of Massachusetts has encouraged vocational education and has paid about one-half the cost. It stands ready to assist forward-looking communities in setting up local training facilities that will accomplish more than educating "handle pushers" and white collar clerks. It has aided not only the usual trade school, but also what might be called the co-operative high school. For years such a school has existed at Beverly, Mass., and a similar enterprise has been encouraged by machine tool manufacturers in Springfield, Vt.

Early this year another cooperative high school course was organized at Springfield, Mass., at the request of local metal-working concerns. Its purpose is to select the best possible applicants from among high school freshmen and to give them a combined high school course and condensed apprenticeship course for which the usual secondary school diploma can be awarded. These boys are not considered merely as good material for future mechanics. The manufacturers back of the plan now have a goodly number of apprentices, but what they want is a hand-picked group which can be turned into designers, supervisors, and road men such as erec-

tors. Possibly some of the graduates will go into sales jobs and others may eventually become executives of the companies.

Why is a high school diploma a part of the plan? There are two good reasons. First, boys from the better stock have been loath to go into the shop. They, and their parents, have been unable to see any advantage in apprenticeship which leads only to the usual shop mechanic's wages. Some special inducement has to be made. Such boys must know that they are to receive more than the usual consideration given to apprentices. They must be assured that the training in the shop and in the school will be so coordinated as to be broad enough to train them for responsible jobs.

In the second place, the selected secondary school education must be comparable to the usual high school education—a recognized value. Besides scientific subjects it must provide a background of English, history and other necessary cultural material.

The Springfield plan was initiated by Roger L. Putnam, president of the Package Machinery Company. His company and five others in the metal working field are cooperating with the local vocational trade school and high school authorities in the training of twenty boys. These are distributed as follows: Package Machinery Company, 4; Van Norman Machine Tool Company, 4; Indian Motorcycle Company, 4; Chapman Valve Company, 4; Wico Electric Company, 2, and National Equipment Company, 2. These twenty boys were selected from 250 applicants who had already completed one year of high school work. Thus, the school authorities were able to obtain a good picture of their abilities. After a preliminary selection by the school men, the boys were interviewed by the respective plant managers and further weeded out.

How the Plan Works

The cooperative high school plan works as follows: Each company takes a pair or several pairs of boys. When one boy of each pair is in school the other takes his place in the plant. The periods are two weeks in school, two weeks in the plant during the regular school year. In the summertime the plan will go right on so far as the companies are concerned, the boys having a vacation in alternate periods.

The boys are paid while working. The rate starts at 25 cents per hour and increases by 3-cent steps every six months. Thus, at the end of two years the cooperative school students will get the same pay as a trade school graduate. In addition, if a boy takes a fourth year of cooperative training, which amounts to a sort of post graduate course, his employer is bound to pay him $100. In any case, the employer pledges to give the boy work continuously during his school years, regardless of business conditions. Of course, the boy must give satisfaction.

Manager Controls Training

Boys signing up with a given plant will remain there until the end of the course. They will not have any specified system of shop training, the details being left to the individual plant managers. When necessary to instruct them in a certain class of work which is not available in the home plant, they will be sent to one of the other cooperating concerns for a short period.

A check on each student's progress will be made by the coordinator from the school. This man functions in the same capacity with the vocational trade school and has the experience to assist the boy and his employer.

School instruction will account for the student's time as follows: drawing, 40 per cent, mathematics, 23 per cent, trade science, 18 per cent, and non-related subjects such as English, civics and general cultural material, 19 per cent. One teacher has been hired to train the boys in school. Later on it is hoped that the other high schools in the city—technical and classical—will assign specialists on scientific and cultural subjects. Then the present teacher will be relieved for devoting himself exclusively to teaching mathematics, drawing and trade science.

When the Central Labor Union got wind of the cooperative high school, a committee was appointed to look into what effect the scheme would have on the supply of skilled labor in Springfield. Mr. Putnam went before the committee to explain. He did not know what to expect, but was gratified to find an appreciative audience which turned a 15-min. talk into a 2-hr. discussion of objectives. The unions evidently do not want a mushroom growth in what they would regard purely as apprentice training. There was no quarrel, however, when they found that the proposition is so highly selective as to accept only 20 out of 250 applicants.

The school department heard a rumor that the C.I.O. organization was also combatting the idea. A member of the school committee, therefore, got the head of the C.I.O. in Springfield and Mr. Putnam together. After the course was properly explained there was a promise of every cooperation. Also out of the meeting there came one or two constructive suggestions, particularly as to the necessity for explaining to the men in the plant what the boys are there for. After all the men in the plant are going to be the best teachers of the boys. The foreman cannot spend all his time doing it. If the boys are there under suspicion, they won't learn what they should.

Other plants are considering joining the movement, and other communities will probably see the advantage of setting up such systems if vocational school facilities are available. It will be some years before graduates are occupying the jobs they are now being trained for, but it is confidently expected that the results in other centers will be duplicated. At least if enthusiasm and genuine support mean anything, the cooperative high school in Springfield, Mass., will achieve its purpose—training boys of special promise to be men of skill and initiative.

Housing Workmen

ONE of the most serious problems that confront any industrial community is that of housing for its workers. We have reports of several instances where new plants were about to decide on a location but were compelled to go elsewhere because of a lack of suitable housing for the workers. Part of the responsibility for this condition dates back to previous land booms, to tract developments that depended on land speculation and huge profits for the developers.

Some municipalities subsidize industries to bring them to town. It might be more advantageous to all concerned to make concessions in taxes that would encourage the building and maintenance of suitable living quarters for workmen and their families. Some are even advocating municipal housing, not so much as an encroachment on private business, but as providing a means of encouraging new industries and of retaining those already established. For suitable housing is just as important as good shipping facilities or fire protection.

FABRICATED TRUCK PEDESTALS

FRANK C. HUDSON

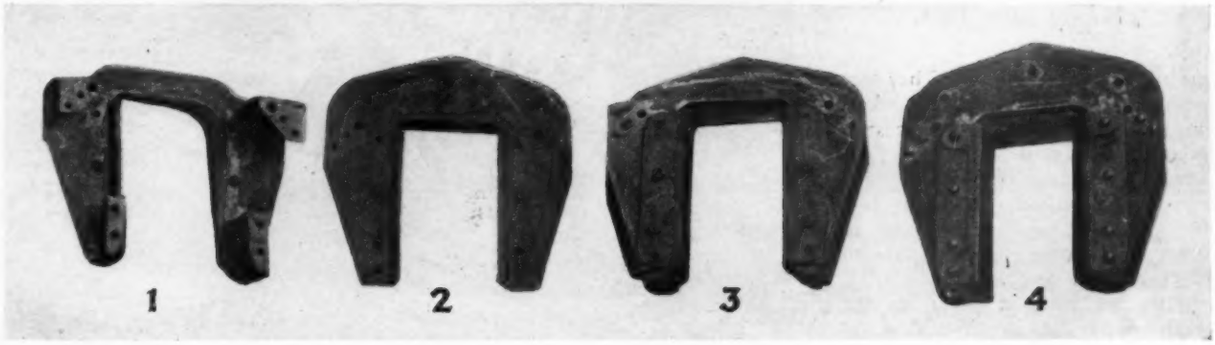
TRUCK pedestals for locomotives and cars no longer depend on the foundry, at least on the Norfolk & Western Railway. Instead they are built up of plate steel to standard designs.

Pedestals are made of two side plates cut to shape with bracket spacers between. The plates are oil-hardened steel. Inner edges of the plates are fitted with guides for the journal boxes. These guides are made of electric cast steel, heat-treated and ground true and smooth. All parts are riveted together. A small amount of electric welding is used at the edges of the upper brackets.

All parts are kept in stock and replacement of the entire pedestal is not necessary. Renewal of the worn jaw surfaces, caused by the constant movement of the journal box as the car or locomotive rolls along the rails, is easily accomplished.

Two pairs of flame-cut side plates are drilled in a jig made from another side plate. A bar welded across the jaws stiffens the jig.

Side plates are flame-cut in pairs from ½- and ¾-in. plates to the proper outline, using a former or pattern



Four stages in the manufacture of a truck pedestal: (1) One pair of wear guides and the four spacing brackets are riveted to one side plate; (2) Another pair of guides is bolted to the other side plate; (3) Both side plates are bolted together for riveting; (4) Completed pedestal ready for assembly in the truck

Practical Pin Measurement

A handy kit helps a lot in applying pin and micrometer measurement to the inspection of small gears

JOHN APELSKOG
Gear Inspector

LONG AGO, pin measurement proved itself to be an effective check for accurate gear cutting. As a means of inspection, this method is simple and direct, requiring no special equipment other than the pins themselves. It may be readily applied to small lots, as well as large, and has great flexibility in its application to various types and sizes of gears.

Most of the difficulty, and possibly the reason that pin measurement is not more widely used, seems to lie in the shop technique for handling the process. Pins the size called for in the "table" are not always ready at hand, and many shop men have not acquainted themselves with the simple calculations for making the necessary corrections. Perhaps the best way to show how this method of gaging may be practically applied is to describe its successful operation in one shop.

In this shop the pins are simply cut off from Grade A drill rods guaranteed to be accurate to within 0.0002 in. The use of drill rod forms an easy method of securing suitable pins without going to an expensive grinding process. It is true that sizes available do not conform exactly to the dimensions in the table given in *American Machinists'* Handbook, but the variation is not great, and the correction may be easily made.

Pockets for Pins

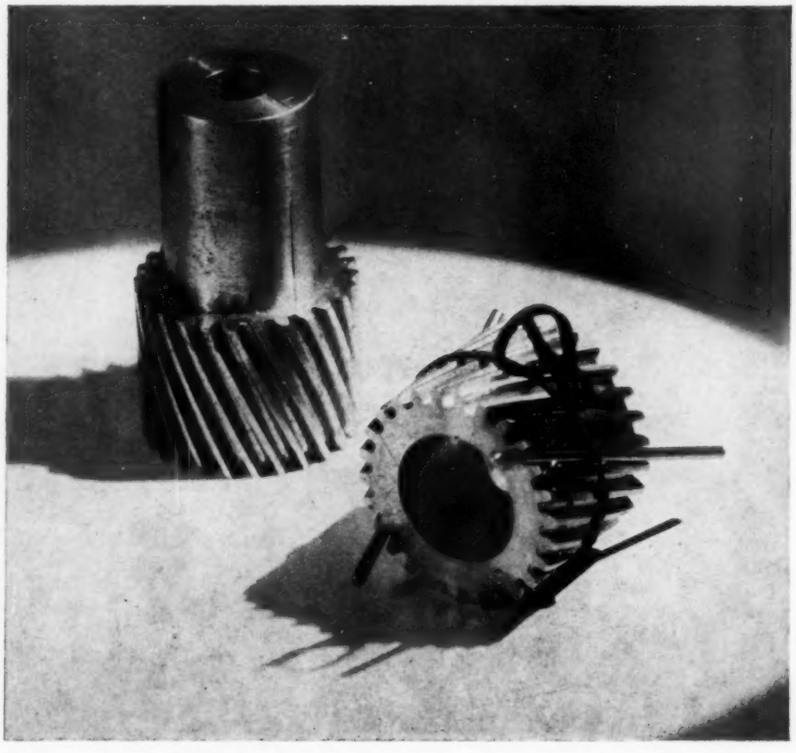
A convenient canvas kit has been made to hold the pins. They are placed in pairs in a series of pockets on which are marked the sizes in decimels to ten thousandths of an inch, and the pitch of gears to which each size is suited. Thus it is easy for the operator or inspector to select the proper pair of pins to check a given gear without delay.

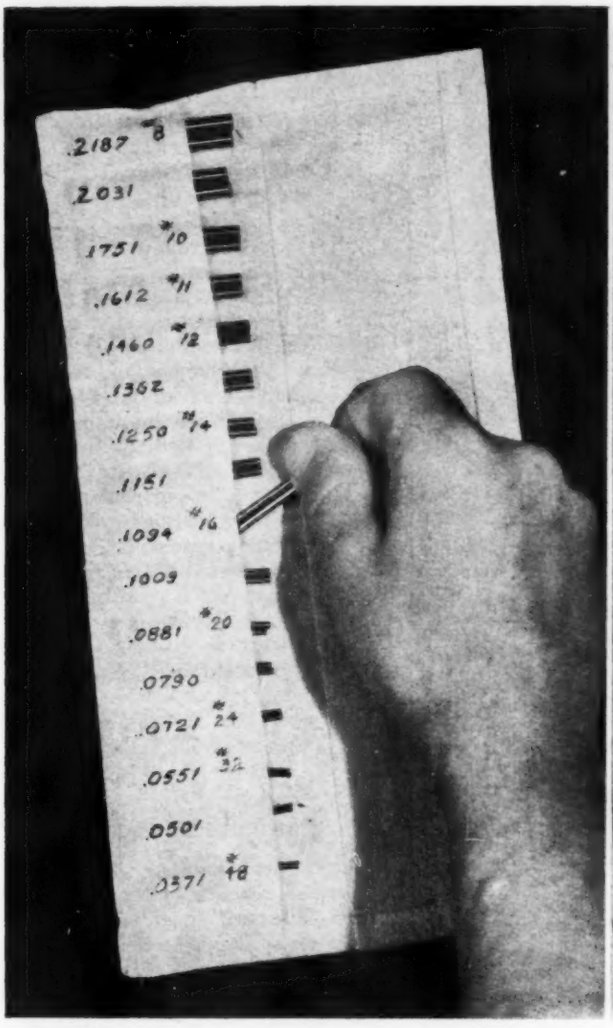
Pins are held in place on the small gears cut in this shop by means of rubber bands. On narrow face gears, it is sometimes necessary to use one band at either end of the pins where they overhang the gear faces, but on wider face gears, the bands may be put right around the gear and pins together without interfering with measurements. Rubber bands, knotted at various lengths, are found convenient when kept with the pin kit. When measuring it is, of course, essential to have the pins exactly opposite for even tooth gears as near opposite as possible for odd tooth gears.

When the pins are in place they are measured by a micrometer; by rocking the anvils back and forth across the tops of the pins the maximum dimension may be readily determined. In order to illustrate the method one or two examples will be given.

Example: Spur gear—diametral pitch, 32; number of teeth, 27; pitch diameter, 0.8437; pressure angle, 14½ deg. From the table, it may be seen that the pin size should be 0.0547 in. The diameter over pins for a 27-tooth gear of one diametral pitch is given as 29.475 in. To find the dimension over a 32 D.P. gear, this figure must be divided by 32 which gives 0.92109 in. It will be noted that the pin available in the kit is 0.0551 which is 0.0004 in. over the size called for. If four ten thousandths is mul-

Helical gears, too, yield to pin measurement if care is taken to keep the micrometer anvil axis parallel to the gear face



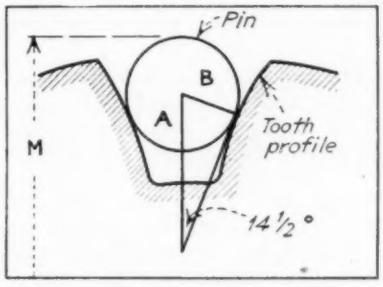


Pins are kept in pairs in a canvas kit which carries their diameters to 0.0001 in. and the diametral pitches for which they may be used

Rubber bands knotted to length hold the pins in place on a 32 D.P., 27-tooth gear while micrometer measurement is being taken

tiplied by five and added to the computed dimension over the pins, this figure will be changed to 0.92309 in., which is what a correctly cut gear should measure if no backlash is allowed.

In this particular instance, it was possible to obtain the constant for 27 teeth directly from the table. In cases where the exact number of teeth does not appear on the table, it is necessary to interpolate. For instance, if a 56-tooth gear is to be measured, the correct value would be between 52 and 62 teeth on the table. Then 62 minus 52 equals 10 teeth. In the table, the value for 62 teeth is 64.586 and for 52 teeth it is 54.576. Subtracting one constant from the other gives 10.01 and dividing by 10 teeth gives 1.001, which is the proportional difference for each tooth. Multiplying 1.001 by 4 teeth and adding the product to the constant for 52 teeth gives the



Small variations from prescribed pin diameters may be corrected by considering the change in measurement *M* to be five times the change in pin diameter in the case of 14½-deg. gears

figure for 56 teeth. Therefore we have:

52 teeth, the constant is 54.576 in.
4 teeth, the constant is 4.004
56 teeth, the constant is 60.080

The reason for multiplying the amount of pin oversize by 5 may be explained as follows. As the pin diameter D changes, the dimension M over the pins varies with the distance between the pin centers plus twice the change in the pin radius. If an oversize pin is used, the change in pin center distance may be measured by twice the increase in dimension A. Since a 14½ deg. gear is under consideration:

$$\text{sin. } 14\tfrac{1}{2} \text{ deg.} = \frac{B}{A} = 0.2504$$

$$A = \frac{B}{0.2504} \text{ or approximately } 4B$$

Then M varies with $(2A + 2B) = 10B$ or $5D$

Therefore, the increase in measurement over the pin is very nearly five times the increase in pin diameter for a 14½ deg. gear. This must be modified for gears having a 20-deg. or other pressure angle.

It is possible also to measure helical gears by means of pins.

Table of Constants for Micrometer Readings Over Pins for Spur and Helical Gears of 14½ and 20-deg. Pressure Angles

Diameter Over Pins Even Teeth			*Diameter of Pins Used*		*Diameter Over Pins Odd Teeth*		
Number Teeth	*Pressure Angle*		*Pitch*	*Size of Wire*	*Number Teeth*	*Pressure Angle*	
	14½°	*20°*				*14½°*	*20°*
10.....	12.415	12.413	1	1.750	11....	13.307	13.303
12.....	14.436	14.428	2	0.875	13....	15.346	15.335
14.....	16.455	16.440	3	0.5833	15....	17.376	17.359
16.....	18.469	18.450	4	0.4375	17....	19.400	19.378
18.....	20.482	20.458	5	0.3500	19....	21.420	21.394
20.....	22.493	22.465	6	0.2917	21....	23.437	23.407
22.....	24.502	24.471	7	0.2500	23....	25.452	25.418
24.....	26.511	26.476	8	0.2188	25....	27.464	27.428
26.....	28.519	28.480	9	0.1944	27....	29.475	29.436
28.....	30.526	30.484	10	0.1750	29....	31.485	31.443
30.....	32.532	32.488	11	0.1591	31....	33.494	33.449
32.....	34.538	34.491	12	0.1458	33....	35.502	35.454
34.....	36.543	36.494	14	0.1250	35....	37.509	37.459
36.....	38.548	38.497	16	0.1094	37....	39.516	39.463
38.....	40.552	40.499	18	0.0972	39....	41.522	41.467
40.....	42.556	42.501	20	0.0875	41....	43.527	43.471
42.....	44.560	44.503	22	0.0795	43....	45.533	45.475
46.....	48.566	48.508	24	0.0729	47....	49.541	49.480
52.....	54.576	54.512	26	0.0673	53....	55.553	55.487
62.....	64.586	64.518	28	0.0625	63....	65.566	65.495
72.....	74.596	74.521	30	0.0583	73....	75.580	75.504
86.....	88.603	88.523	32	0.0547	87....	89.590	89.511
102.....	104.613	104.529	34	0.0515	103....	105.602	105.517
122.....	124.619	124.532	36	0.0486	123....	125.610	125.521
142.....	144.627	144.535	38	0.0460	143....	145.618	145.526
160.....	162.627	162.535	40	0.0437	161....	163.618	163.526
180.....	182.627	182.535	44	0.0398	181....	183.618	183.526
200.....	202.627	202.535	48	0.0365	201....	203.618	203.526

Spur Gear:
Take constant from table and divide by the pitch of the gear. This will give outside diameter over pins.

For Helical Gears:
Take constant for equivalent spur gear from table and divide by pitch. Subtract the B.D. of the equivalent spur gear and add the B.D. of the helical gear. This will give the measurement over the pins for the helical gear.

N = No. teeth in helical gear.
N' = No. teeth in equivalent spur gear.

$$N' = \frac{N}{(\cos A)^3} \qquad A = \text{helix angle}$$

$$\text{P.D. of helical gear} = \frac{N}{\text{D.P.n x cosA}}$$

$$\text{P.D. of equivalent spur gear} = \frac{N'}{\text{D.P.}}$$

When a pin is laid in a tooth space of a helical gear it may be rocked, and for this reason, special pins have been devised which depend on point contact. However, it will be found practical to use straight pins, the same as those used for spur gears, if the measurements are carefully made. The procedure is the same as with spur gears, but special care must be made to keep the axis of the micrometer anvils parallel to the face of the gear.

In selecting values from the chart for helical gears, it is necessary to find the number of teeth in the equivalent spur gear. This is done by dividing the number of teeth in the helical gear by the cube of the cosine of the helix angle. The pitch diameter of the equivalent spur gear is obtained by dividing the number of teeth in the equivalent spur gear by the normal diametral pitch.

As an example of helical gear measurements, consider a gear with the following specifications: diametral pitch, 24; number of teeth, 26; helix angle, 22 deg., 38 min. 16 sec. Then the computation for this gear will be as follows:

$$N = \frac{N}{(\cos A)^3} = \frac{26}{(\cos 22°38'15'')^3} = 33.069$$

The equivalent number of teeth, 33.096, lies between 33 and 35 teeth on the table. Subtracting one constant from another:

37.509 — 35.502 = 2.007 or 1.0035 per tooth

35.502 + (0.069 × 1.0035) = 35.5712

Constant for 33.069 teeth = $\frac{35.5712}{24} = 1.4821$

Equivalent spur pitch diameter = $\frac{N'}{\text{D.P.}} = \frac{33.069}{24} = 1.3778$

1.4821 — 1.3778 = 0.1043

Adding to the pitch diameter of the helical gear:

0.1043 + 1.1740 = 1.2783

Since the table calls for pins of 0.729 in. and 0.720-in. pins are available, a correction of 5 × 0.009 = 0.045 in. must be made

1.2783 — 0.045 = 1.2738 in.

This is the value *M*, the required measurement over the pins.

When the number of teeth is larger than given in the table the constant is obtained by adding two to the number of teeth and by using the last decimal constant that appears in the table. For instance, for 284 teeth the constant would be 286.627. For a gear with 265 teeth, the constant would be 267.618. The only thing to watch is to be sure to use the decimal for an even number of teeth when an even-tooth gear is being considered and that for an odd number of teeth when an odd-tooth gear is to be measured.

Paint That Pleases

Satisfactory painting of machine tools and other shop equipment has been discussed many times. We have seen almost everything from black to white with green, gray and red as in-between favorites. White probably reflects the most light but it seldom remains as a standard color. About 40 years ago the Pittsburgh Locomotive Works painted all its machines white, a startling innovation in the smoky city. But oil stains disfigured the paint and it was abandoned. Newer enamels are much better however. The Bullock Electric Co. painted all its machines for the Norwood, O., plant with aluminum, before it was sold to the Allis-Chalmer Co.

Some years ago the N M T B A adopted the "machine tool gray" that is now so common. But some of the machine tool builders prefer lighter colors and are using them in their own shops. In the Gould & Eberhardt shop they have a leaning toward two-color jobs and they are very attractive. The lower part of the machine, next to the floor, is a warmer gray than the standard, and the upper part is a sort of cream, a very pleasing combination of colors. The dividing line between the color depends on the contour of the machine, just as in a two-color job on an automobile.

TALKING SHOP

One-way Loyalty

People have funny ideas about loyalty. To most of us it's a reciprocal arrangement as typified by the "one for all and all for one" of the Three Musketeers. Long before the days of old age pensions the "old man" of the shop made it a point to look after the men who had grown old in his service. Many of them had refused offers of more money to go with a competitor, and he knew it.

In too many cases, however, the management of large corporations seems to think of loyalty as a one-way proposition—talking much about loyalty and expecting it of their men, but forgetting the other side of it. The latest example is that of a production man who has done good work in several plants of a large com-

pany for over a quarter century, to be dropped from the rolls on his 60th birthday. It isn't that he is likely to go hungry for he has saved something through the years. But his pride of achievement was given a wallop that may shorten his days. If management thinks this sort of thing doesn't have its effect on the men in the shop they'd better guess again.

Efficiency Begins at Home

Everyone is familiar with the so-called expert who walks into a plant and starts to save money by tearing up the machinery, moving it around and rearranging processes which represent years of effort in solving a particular manufacturing problem. Recently the supervisor of the sheet-metal department of an aircraft factory solved a reduction in cost problem without moving one machine or changing manufacturing methods.

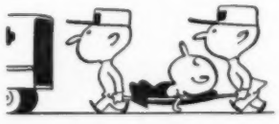
The cost of wing ribs, which were being stamped out of sheet in a press, was found to be almost twice the estimated cost. Upon investigation the supervisor found that it was not the operation of the press or the type of work being done which was at fault. He did find the operator of the press walking some ten feet to a pile of aluminum alloy sheets, picking up a sheet, walking back, inserting the sheet in the press, stamping, removing the formed rib, and walking ten feet in another direction to place the rib on a pick-up.

The walking tours were eliminated by placing the sheets on a movable cart of such height that the sheets can be pushed into the press with little or no lifting on the part of the operator. The pick-up cart was moved next to the press so that the operator had only to lift the rib from the press, turn and place it on the cart.

Accident Causes

A recent report on accident rates in the machinery industry duing 1936, published by the National Safety Council, indicates that the principal cause of injury is machinery. Although some companies have almost eliminated losses of fingers and hands in punch press operations, machines of this type were involved in one-third of all reported cases. These machine operators were involved in more serious accidents than other occupations. Next in importance were maintenance men, machinists and helpers, laborers, welders, supervisors and toolmakers.

Of the various types of accidents, "caught in or between" best describes one-half of them. These occurred mostly in or around machinery when employees put hands and fingers near moving parts. Such actions usually occur when difficulties were encoun-



tered in the operation of the machine and in making adjustments or repairs.

Chance taking, disregard of instructions and other wrong attitudes on the part of employees were the principal personal causes of serious injury. Disregard of instructions about the operation of safety devices and the making of repairs or adjustments on machines while they are in motion frequently leads to serious accidents.

According to this report, the machinery industry has not equalled the progress of other industries in reducing its injury rates during the past ten years. This is particularly true of its frequency rate, for which the improvement is eighteen per cent less than the average for all industries. The net results in severity have, however, been better, in comparison with the reductions by other industries.

Rubber Templates

A Mid-Western heavy sheet-steel fabricator learned something about moisture and wood recently. He had an order for W-bars 40 ft. long, to be punched in a number of places throughout their length. A conventional wooden template was prepared, shellacked, and drilled for marking

punches for centering holes later to be punched. Most of the order went through without comment from the purchaser, but the last several hundred brought a telephone call of protest—the bars were anywhere up to $\frac{7}{16}$ in. too long, with holes varying proportionately in position. Now, this fabricator prides himself on his accuracy, so he promptly hied himself to the purchaser's plant, ready to prove that somebody at the other end was using a rubber measuring tape. But his own steel tape proved the fabricator wrong.

Then came the investigation. The answer was simple enough. That wooden template had lain under a leaky monitor during a thunderstorm. The shellacking prevented any complete drenching, but dripping water had found its way into the marking-punch holes, swelling the template so that it gained just $\frac{7}{16}$ in. in length. During the next day's use it gradually dried out (it was near a big furnace), so that marked bars varied from 40 ft. $\frac{7}{16}$ in. down to 40 ft. exactly. *The Editors*

Good Jib Cranes and Bad

If stresses are not checked there is likelihood that some member of the crane will fail in service

C. C. HERMANN
Philadelphia District Engineer
Claude B. Schneible Company

FROM observation, I know that many home-made jib cranes are unsafe for loads that they are often called upon to handle. There is no good reason for this condition, because a home-made jib crane can be as safe and serviceable as one procured from a manufacturer. A satisfactory job is a matter of correct design, selection of materials and fabrication. So from years of experience in designing such shop appurtenances, I shall pick out a few designs to illustrate bad and good practice.

No wonder the jib crane shown in Fig. 1 failed in service. This crude affair was built by a maintenance man, who probably got his idea from looking at a truss. Unfortunately, his crane was never checked for stresses in the mast, boom or supports. Stresses in a crane boom are different from those in a truss, and the maintenance man's design only gave rise to a sense of false security. Moreover, his design was wasteful of steel and labor.

Examination of Fig. 1 discloses that member *a* is in tension, member *b* is in compression, and the two members *c* are in tension. Tensile stress in member *a* is as follows:

$S_t = 10{,}000 \times 191/36$
$= 53{,}000$ lb.

Member *a* is 191 in. long, and the distance between the point of attachment of the boom and the tie rod to the mast is 36 in.

Similarly the compressive stress in member *b* is:

$S_c = 10{,}000 \times 174/36$
$= 48{,}300$ lb.

Considering the boom assembly as a beam, maximum moment occurs when the load is at the center

$M = 10{,}000 \times 174/4$
$= 435{,}000$ in. lb.

With a unit stress of 16,000 lb. per sq. in., the boom assembly should have a section modulus of 27.2 in.^{3}

Instead of calculating the strength of the jib crane as indicated in Fig. 1, substitute a 1/8-in. steel plate for the members *c*, and calculate the boom as a rigid beam. From a steel handbook assemble the data in Table I. This table is compiled on the assumption that the triangular composite beam is equivalent to a beam 18 in. in depth. Then y_n in the table is the distance of the neutral axis of each component to the base of the beam. And the neutral axis of the composite beam is then:

$$y_c = \frac{2[0.69 \times 17.53] + 2.27 \times 0.88 + 2.25 \times 9}{5.9}$$

$= 7.87$ in.

The value d_c, the distance between the neutral axes of the components and composite section, is obtained by subtracting y_c from y_n. Section modulus of the composite section is the moment of inertia divided by the distance to the most remote fiber, or

$305.38/(18-7.87) = 30.1$ in.^{3}

This value is close to and safely exceeds the required section modulus of 27.2 in.^{3}

A better way to design this crane boom is shown in Fig. 2. In this design the boom is an I-beam taking a bearing on the mast, and a tierod is used from the end of the boom to the top of the mast. From the information at hand the boom must be a 10 in.—35 lb. I-beam and the tierod must be a 2-in. round bar.

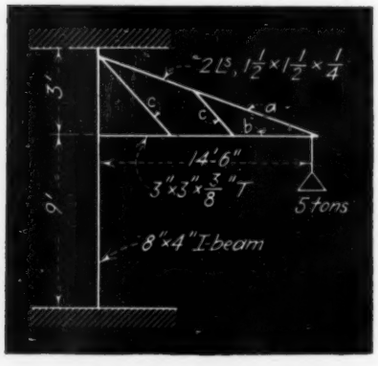


Fig. 1—Truss design for a job crane is not good practice, and members *c* only give a false sense of security

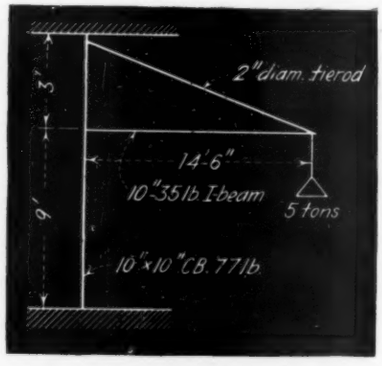


Fig. 2—A better design consists of an I-beam for the boom and a round bar for the tierod

Table I—Calculations for Moment of Inertia of Modified Crane Boom in Fig. 1

Member	Size	Area	y_n	d_c	Ad_c^2	I	$Ad_c^2 - I$
a	1½x1½x¼	0.69	17.53	9.66	64.38	0.14	64.52
	1½x1½x¼	0.69	17.53	9.66	64.38	0.14	64.52
b	3x3x⅜ T	2.27	0.88	6.99	110.91	1.80	112.71
c	⅛ in. plate	2.25	9.00	1.13	2.88	60.75	63 63
		5.9			242.55		305.38 in.^{4}

Table II—Calculations for Moment of Inertia of Jib-Crane Boom in Fig. 3

Member	*Size*	*Area*	y_n	d_c	Ad_c^2	I	Ad_c^2-I
f	7 in. channel	2.85	0.55	5.45	84.65	0.98	85.63
g	7 in. channel	2.85	0.55	5.45	84.65	0.98	85.63
h	¼ in. plate	3.0	6.0	0	0	36.0	36.0
k	¼ in. plate	3.0	6.0	0	0	36.0	36.0
		11.70					243.25 in.⁴

Thrust on the mast comes at a point 9 ft. above the base and 3 ft. below the top. When calculating the thrust the weight of the boom should be added to the weight of the load. Thrust is thus found to be 51,265 lb. The bending moment for the mast is then:

$$M = \frac{51{,}265 \times 36 \times 108}{144}$$

$$= 1{,}384{,}155 \text{ in. lb.}$$

Section modulus is 1,384,155/16,000 = 86.5 in.,³ corresponding to a 10 × 10 in. CB section weighing 77 lb. per ft.

The fastenings at the top and bottom of the mast must be designed to take the reaction as follows:

$R = 51{,}265 \times 108/144 = 38{,}448$ lb.

$R^1 = 51{,}265 \times 36/144 = 12{,}816$ lb.

Although there are many other types of jib cranes, they may be all analyzed on the same basis and the method given above will apply in most cases.

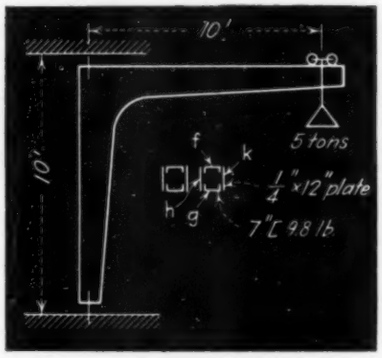


Fig. 3—For low headroom conditions, this type of jib crane answers well, and it is built of standard sections

Another type of jib crane is widely used because it conserves headroom. This crane, shown in Fig. 3, is calculated similarly to the method given above. Standard channels and plates are used in the construction.

Table II lists the calculated data for both the mast and the boom, since both are the same length. The maximum bending moment is $Wl = 10{,}000 \times 10 \times 12 = 1{,}200{,}000$ in. lb. Required section modulus is 1,200,000/16,000 = 75 in.³ Areas and moments of inertia for the various components are taken from a steel handbook. The sections chosen are 7-in.—9.8-lb. standard channels for the top and bottom members with ¼ × 12 in. side plates. Two built-up members of this construction are utilized and they carry tracks on the upper surfaces for the trolley. The mast is pivoted at the bottom and the top by pins operating in ball races for ease of operation.

Calculations of the neutral axis is as follows:

$y_c = 2.85 \times 11.45 + 2.85 \times 0.55 + 3 \times 6 + 3\ 6/11.7 = 6.$

This result is obvious since the built-up beam section is symmetrical about the neutral axis.

The section modulus is 243.26/6 or = 40.54 in.³ This must be multiplied by two since there are two arms in the crane, making a section modulus for the assembly of 81.08 in.³ This compares favorably with a required section modulus of 75 in.³

Locked Up Stresses—A Fallacy

C. J. HOLSLAG, *Electric Arc Welding and Cutting Company*

Not so long ago this country was beset with the terrors and evils of witchcraft. Arc welding is similarly hampered by a bug-a-boo, alleged locked-up stresses. It is hard to disprove a belief in something that does not exist.

In my sincere opinion and belief, there is no such thing as locked-up stresses in mild steel, and belief in them or uncertainty concerning their existence tends to impede arc welding.

In welding heavy-walled, large pressure vessels and heavy frame construction, it is necessary to normalize the heat distribution while welding, but this is a necessity in manufacture and nothing whatever to do with alleged locked-up stresses.

Having had as much experience in the observance of the welding of light, medium and heavy-walled structures on this planet as anybody, I have yet to see anything that would lead me to believe there are stresses in mild steel from welding that would not disappear within 24 to 48 hours. Ninety per cent of them disappear when cool from the welding. The warping, deformation and possible rupture of heavy-walled structures should not be confused with these locked-up stresses although it appears that some manufacturers who build ovens apparently allow the buying public to indulge in such an illusion. Ships, locomotives, buildings and even field work on the heavy-walled vessels and structures themselves cannot be so-called stress relieved. There has never been failure resulting from this lack. To put it even plainer, a heavy pressure vessel made under these careful alleged stress-relieving methods will have its field connections made in the open air in various climates and both welds are equally good.

If I am wrong I hope somebody will come out with proof of these harmful stresses in mild steel, as a great deal of money is being spent to photograph these "fairies in the rose bush". I, myself, contributed money upon the promise that if the stresses were not in an amount to be harmful an authoritative report would be thus published, but research investigators do not like to give up as long as they are being paid. The only way of getting rid of these failures in welding procedure attributed to this phantasmagoria is to laugh them away. It is my sincere opinion that the people who are searching for these stresses are in the position of the three blind men in a dark room groping for a black hat that is not there.

Danger Lurks in Low-Voltage Circuits

Real hazards may be found in 110- and 220-volt light and power circuits; simple rules make for safe conditions

J. ROSEVEAR
Assistant Plant Engineer
Westinghouse Lamp Division, Bloomfield, N. J.

THE AVERAGE individual forgets the potential dangers in using lighting equipment and electrical appliances, because of their widespread use in the home. Nearly everyone has experienced slight shocks without ill effects. Under some conditions these shocks can become extremely dangerous; death has occurred in many instances.

The amount of shock received is dependent on the contact made and through what part of the body the current has to travel. Contacts between the hand and the arm are not as dangerous as between both hands, as then the current must pass through the body in the region of the heart. Contacts at both wrists, instead of both hands, are even more dangerous as the calloused skin of the hands has more resistance than that of the wrists.

A person who is perspiring, and whose skin is somewhat damp, will receive a much more severe shock than one whose skin is dry. Individuals react differently to shock; what would give one only a nasty shock might kill another person. Low-voltage shock produces a muscular spasm. If enough current flows it will cause coagulation of the blood and probably death.

Hazards common to low-voltage circuits may be found in exposed wiring, portable cords, broken lighting sockets, untaped terminals on motors and transformers, open knife switches and portable lamp equipment without lamp guards.

Open wiring is too often permitted; after a long period of time the insulation deteriorates. A slight mechanical injury may expose the bare conductors and produce a source of possible shock. Portable lamp cords are made to withstand more severe service than wires in conduit; they must, however, be inspected frequently for poor insulation and mechanical injury.

More important that the portable cord is the type of lamp socket used. This is the business end and is handled most by the person using the unit. The best type of holder is one made of dried, treated wood or other insulating material; the lamp socket should be so arranged that it does not project outside the handle. All connections should be made within the base of the holder.

Invisible hazards include electrical circuits that are not grounded, balance coil circuits obtaining 110-volt lighting from 220-volt power circuits, overfusing of circuits, improper grounding of both permanent equipment and electric tools and portable lamps for hazardous locations.

All motors, starters, machine shop

Electrical circuits can be made and kept safe if suitable materials are used and proper care is taken to maintain equipment in good condition

Properly installed control units eliminate many of the hazards of low-voltage circuits. careful use and good housekeeping keep such circuits safe

equipment and other equipment that is connected to or attached to an electrical device should be grounded. This protects the operator as the machine is then always at ground potential.

Typical Accident

The following near accident is typical of what may happen when this rule is disobeyed. A qualified electrician wanted to drill a hole in a pipe hanger in the ceiling. He placed his step ladder in position and plugged in the electric drill cord at an outlet, but forgot to attach the ground clip provided for connection to the conduit.

He then climbed the ladder and grasped the overhead piping with one hand for support. Holding the drill in the other hand, he turned on the switch to see if the drill would operate. He received a shock, strong enough to upset his balance on the ladder.

Fortunately he was able to let go of the drill as the ladder toppled and grasp the piping for support. His calls for help were soon heard and the ladder was replaced, permitting him to return to the floor shaken, but not injured.

What had happened? The electric drill had developed a ground in the field coils and he received a shock as soon as the switch was closed. If he had used the ground clip a fuse would have blown at once, and the drill would have been repaired before re-use.

Exposed terminals constitute a hazard of considerable importance. It is easy for a workman to touch these terminals and receive a severe shock. He can also drop a metal tool on these terminals, causing a short circuit, and damage or completely shut down the equipment. Open knife switches used to make and break circuits, unless in a power house under the care of a competent operator, should be inclosed in a protecting cabinet.

Abstracted from an address delivered before the New Jersey chapter of the American Society of Safety Engineers, Hackensack, N. J.

Simple Safety Rules

1. Use materials suitable to the job.
2. Give proper maintenance to all equipment.
3. Use special precautions with electrical equipment when in hazardous locations.
4. Live up to the rules and regulations of the National Electric Code and your state and municipal codes.
5. Remember that you cannot see, hear or smell electricity in an exposed part or wire. When you feel it, it is often too late.

ROUND TABLE

An M.D. on the Payroll?

"This is still a small plant, Ed, even though we do manage to ship a lot of pumps every month. However, the economies experienced by larger companies as a result of maintaining a regular medical staff have convinced me that we should go further in that direction."

"You're keeping a trained nurse here now, Al, and there's a hospital only a couple of blocks down the street. What do you do—lay awake nights trying to think of ways to spend some more money?"

"I'll probably be able to pay a larger dividend if this plan works out—so forget that side of it for the time being. Here's the story—Dr. White and I have been discussing various industrial health problems of late, and we decided to try a part-time medical advisory service here for a year. If it doesn't more than pay its way, we'll go to something else at the end of that time."

"Doc is a good man, well liked by everyone—but he won't come out here for nothing."

"I don't want him to. He has, as a rule, at least two mornings every week when he isn't very busy. We'll contract with him to spend those mornings here at the plant—examining applicants and those who are already working and want to have a free medical examination. He'll also start a small class in first aid for my key men."

"Going all the way, aren't you? Are you going to furnish free medical supplies and drugs, as well as treatment?"

"Only where the trouble is caused by some shop condition."

"The men will probably think you're too darned inquisitive and will hesitate to take the examination. They might fear being fired if there's something wrong."

"We won't fire anyone because he needs medical care—but we will see that he gets fixed up if there's something wrong and it is interfering with his work. Often a man doesn't suspect that there's anything wrong until he's been looked over."

"You'll probably have a lot of chiselers—just because its a free service, better go slow with your plans, Al."

"I don't think so, Ed. I'm hoping to prevent accidents and build up a better working force."

"Your foremen can probably point out the sickly men to you without your spending money on all the rest. Most of the men would probably prefer to deal with their family doctor anyway."

Can advisory medical service of this kind be justified? Or, is Ed right in fearing the results of such a plan?

DISCUSSION

New Man

Except in very unusual cases, there will be more lost than gained in attempting to give any new man a broad view of the situation in any given shop. Certain types of job shops will be an exception to this rule, for there the work is special and a man must depend largely on his own judgment in arranging the routine of his work and making machine set-ups. However, in shops where work is standard to an appreciable degree, the necessary instructions and data can be compiled and given to the man before he starts a job.

The day has passed when a print goes into a manufacturing department of a well-ordered factory without being accompanied by the necessary manufacturing information. With prints and instructions made complete in every detail, and with staff men assigned to keep this information up to date, there is little, if any, reason for the individual operator to concern himself about methods.

What little information that will be lacking on the print, can be explained by his immediate supervisor. —JOHN E. HYLER

Many a shop man has wasted time and patience because he does not know the purpose of the part he is making. Al's plan to familiarize each new man with the various operations will be reflected in better workmanship and sound judgment on the part of all shop workers. Quality of judgment is one of the major factors that distinguishes a first class mechanic from one that deserves only a mediocre rating.

—ROBERT KNOTEK

Believe in Signs?

Elimination of safety hazards is, by far, a more important thing than the plastering of signs all over the plant. Placing a sign at a definite hazard

where caution is required is, however, a necessary and desirable thing.

Bulletin boards should be reserved for something of definite value. It is the easiest thing in the world to clutter them up with a lot of well-meaning but fruitless safety-propaganda posters. Better results can be obtained by giving attention to the men who are accident repeaters.

—O. W. WINTER

The advisability of having dramatic posters displayed is, I think, quite evident. There is little doubt in my mind that their presence in any shop aids greatly in minimizing man-made mistakes, and saving lives.

Some years ago, while applying for a position in a plant in Philadelphia, I noticed several warning signs. I wondered at the time whether men are so careless that posting of signs must be necessary. I think now that the fault lies rather in the direction of forgetfulness, for men are not voluntarily careless as a rule.

Al is wrong in taking these posters down. From his ideas, I take it that once having made a mistake a man has a penchant for repeating that mistake, just by reason of extra effort to avoid it. I rather believe that a burnt child avoids the fire. Most mistakes are useful. —G. MCARDLE

What Price Spare Parts?

Spare parts for machines over a certain age should be charged for sufficiently to cover the original cost and storage.

The supplying of old spare parts often involves a loss. For instance, it means keeping a stock of spare parts which may never be needed or there may be a rush on certain parts with the result that the stock is exhausted and new parts may have to be specially made. Spare parts are often only used to patch up old machines which have passed the limit of their useful life, and this only acts to reduce the demand for new machines. Manufacturers should only undertake to supply parts for machines of recent date, and after that at an increased price but only while the stock lasts.

Most second-hand dealers supply spare parts and often buy up old machines for getting spares only. If the spare-part business for machines over a certain age could be left to these merchants it would increase their business and save manufacturers both expense and worry, and in many cases give customers better service.

—W. E. WARNER
Sompting, Sussex, England

Maintenance Machinist

GILBERT G. COOMBS

It was a pleasure to learn from John J. Hill's article under the above title (*AM*—Vol. 81, page 679) that the need for the all-around machinist is still recognized. Of course, those responsible for the fallacious statement that the type is extinct are those who follow production methods which tend to create experts in a very narrow field of operations. However, the writer being in the same profession (the word is used advisedly) as is Mr. Hill, he is thoroughly familiar with work that requires experience, having dimensions other than length.

There is no doubt that job shops and plant repair shops create the all-around machinist, yet the brush of efficiency paints us all the same color and we are prone to specialize just as much as our work will permit. Several years ago I was given the task of organizing a repair department for a plant that was equipped with enough types of machinery to make Solomon stroke his beard—even supposing that Solomon was a machinist. The orders were "Hire and fire until you get what you want," and for several months the personnel department was kept busy doing just that. At the end of that time I had collected as efficient a crew of all-around machinists as one could wish for. Their collective experience ranged from lumber mills to marine work and I was satisfied that with my little bit of experience thrown in we could handle any situation that might arise.

Being thus well equipped, did I take jobs as they came and hand them out to the first man who needed a new job? Of course not—I immediately started to specialize. Tom was a crackerjack lathe hand, and to the lathe he went and stayed. Harry had the making of a turbine expert and today all the important turbine work and balancing is done by Harry. Fred exhibited the right technique for handling multi-stage centrifugal pump repairs and gets enough of that class of work to keep him busy. Of course, the idea is not run into the ground—Harry has received training on Fred's work and Fred is no fool with a turbine, but the fact remains that for every important type of work we have our specialist.

Yet shops of this kind contribute their share toward producing all-around mechanics, if our case is typical. The young fellows who are learning the trade in our shop are given training of such diversified nature that they will eventually be able to handle any class of work with a minimum amount of instruction. Specific aptitude for any particular kind of work is not allowed to interfere with this training, but if the boys remain with us they will in time be fitted to the job for which they best qualify. If they leave us, they will be thoroughly justified in answering any advertisement that reads "Wanted—All-around Machinist."

One Gage for Three Holes

F. M. A'HEARN

I did not solve the problem and, oddly enough, only once before encountered it. Robert C. Dickey's "After Fifty, What Then?" (*AM*—Vol. 81, page 657), affords an excuse for offering the following:

In apprenticeship days, early in the nineties, a species of mechanic now comparatively unknown roamed the country. Two explanations accounted for their presence: One that these tramping "jours", (journeymen) were a survival of the days when a young mechanic, after serving his time, worked from job to job to broaden his trade knowledge before finally settling down; the other that many of the workmen had fought through the Civil War and had thereby become more or less vagrants owing to the separation of home ties during the long struggle.

Among these "boomers", as they were sometimes called, was the one who submitted the puzzle to the writer. Ever industrious, when sober, "Old Steve" would spend waiting time by whittling pieces of wood into various trick devices. A piece of cigar box lid was perforated, as in the puzzle, and the plug made to fit. This was easily carried in the pocket and was good for a bet of "drinks" that a gage could be made to fit the three holes.

Like all of his type, Steve seldom had tools until he had a chance to make a hammer and a few pairs of firm joint calipers; otherwise pin gages of small rounds and outside calipers of the same material sufficed. We worked at the same bench. The old man was grateful for the loan of tools, soap, "chawing terbacker", and many other things not available until after pay day. In return many valuable pointers gathered in years of wandering were imparted by Steve to the less experienced man. Trade tricks without end were known by these wanderers. They gathered and spread information over a wide area and many an old-time machinist will think kindly of them.

Auxiliary Vise Jaws for Milling Operations

Additional designs for these useful adjuncts enable the resourceful designer to meet a variety of clamping, centralizing and equalizing problems

C. W. HINMAN
Tool Engineer
Kobzy Tool & Electric Manufacturing Company

AN EQUALIZER may be attached to the moving member in a pair of auxiliary jaws, as shown in Fig. 130, for clamping a piece on non-parallel edges.

In Fig. 131, a pair of auxiliary jaws holds a piece of work for straddle milling. Blade *A* is a separate member lying between the jaws; it is a shelf support underneath the work, and is attached to the stationary jaw. The work registers against pin *B*, which causes dimension *X* in the work to be constant in all the pieces milled. In the other contingency, when dimension *Y* is to be the constant, blade *A* is extended at the left to provide a stop at the tongue end of the work.

In Fig. 132, there is a pair of auxiliary jaws, and a pair of secondary jaws that slide within them. This design presents two important principles in clamping; namely, centralization and equalization. The main jaws are the overhanging type as shown in the end view. The work *A* is clamped, centered and equalized between the second jaws *B* and *C*, which are at right angles to, and are operated by, the main jaws *D*.

The secondary jaws are shown separately in Fig. 133, and have projections *E* and *F* underneath them. Projection *F* on jaw *B* is a 90-deg. included angle, while projection *E* on jaw *C* is the radius of a circular segment. These projections are engaged in the two 90-deg. angular pockets in the main jaws. As the vise closes the main jaws, it forces the secondary jaws to approach each other equally by reason of the equal angular slip on *E* and *F*. At the same time jaw *C* is allowed to turn slightly on circumference *E*, causing it to clamp the work its entire length even though the sides of the pieces are not exactly parallel. A strong compression spring is inserted between the secondary jaws, as shown, to prevent them from tipping when closing on the work, and to separate them when opening the vise.

A so-called "equalizing vise," is especially made for centering the work between its jaws, for making centralized milling cuts in work that varies in width. In this case, both

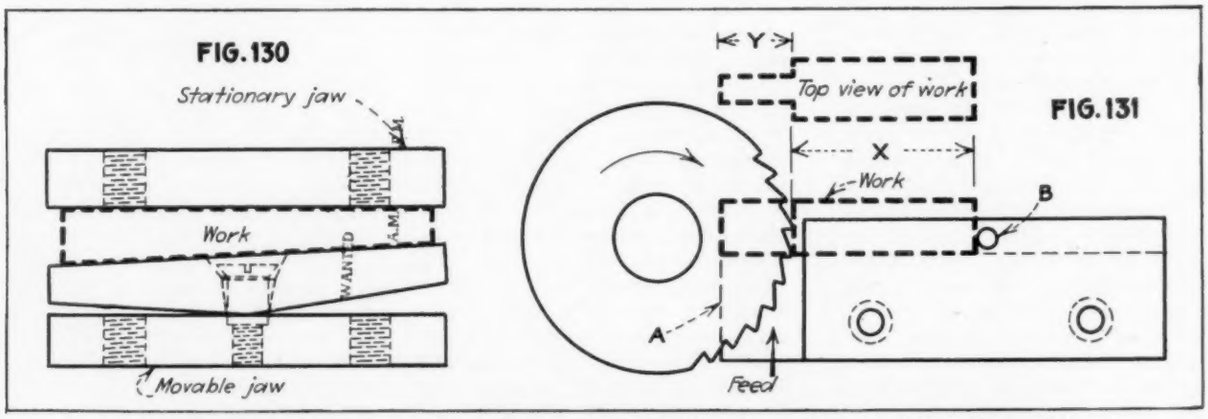


Fig. 130—Non-parallel edges of the work are accommodated by the equalizer attached to the movable member. Fig. 131—Blade A, lying between the auxiliary jaws, supports the work from underneath

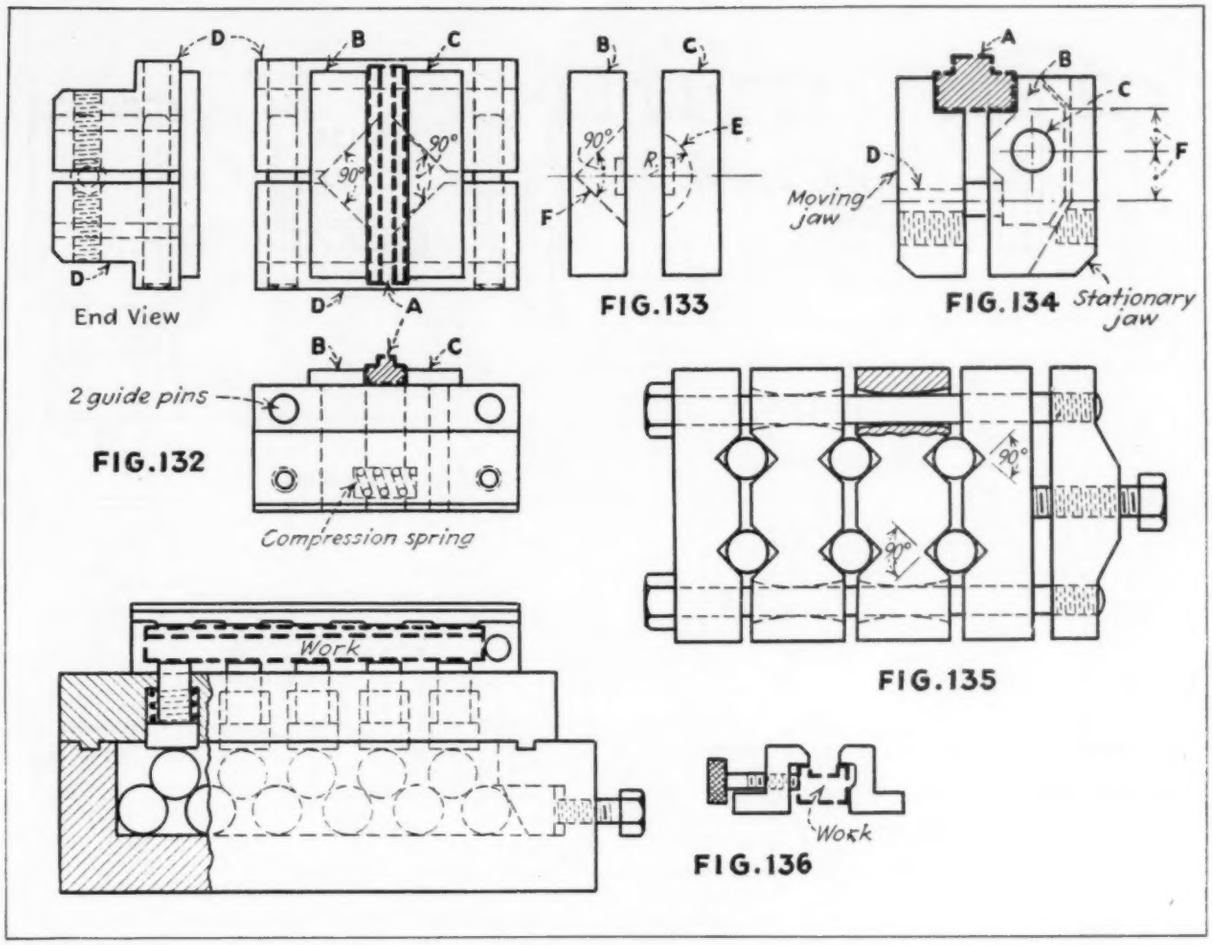


FIG. 132

FIG. 133

FIG. 134

FIG. 135

FIG. 136

jaws are moving members, and are operated by a heavy screw and crank. The screw is cut with right- and left-hand threads, and when rotated in the vise, moves the jaws equally apart or vice versa, when opening or closing them.

The same result can also be obtained in an ordinary vise by using the principle shown in connection with the auxiliary jaws sketched in Fig. 134. The tongue *A* is to be milled central with the body of the work, when the widths of the different pieces vary. The rocker jaw *B* is secured in a chamber in the stationary jaw on pivot pin *C*, this pin is centrally located between the contact point of the rocker jaw, and the thrust pins *D* in the moving jaw, as shown by the equal distances *F*. Coiled compression springs, not shown, hold the clamping part of the rocker jaw open when the vise is not closed upon the work. As the movable jaw is being closed, the thrust pins contact the lower part of the rocker jaw, and moves its clamping part towards the work with the same speed as that of the movable jaw. It is obvious by this construction that these jaws approach the work equally, positively and in parallelism, and that after the tongue *A* has been straddle milled, it will be in the center of the strip, regardless of slight variations in the width of the pieces. The setup is made by using a templet having the same cross-section as the finished work.

Many of the principles described in previous articles for clamping and supporting work in drilling jigs are also applicable for the same purpose in milling fixtures. One in particular is the "touch pin." A touch pin is used for supporting a frail projection on a casting against a machine cut. It is used after the main body of a casting has been registered and clamped in the tool. In principle, it is a sliding pin in the fixture which is advanced by hand until one end touches the frail member in juxtapositional support with the desired cut. The pin is then locked with a "hug bolt," or by a screw, the point of which bears against an angular flat on the sliding pin. When a compression spring is used under a pin to make it contact the work, it is then called a "pop pin," and advancing it by hand, before locking, becomes unnecessary. These supporting devices were illustrated in Figs. 60, 61, 62 (*AM*—Vol. 81, p. 408).

Fig. 135 shows a method for clamping a double row of pins in multiple equalization, for milling or other purposes. Any reasonable number of pieces can be rigidly clamped by a single screw, regardless of commercial variations in the diameters. There are cases in practice employing this principle, where 40 pieces are clamped.

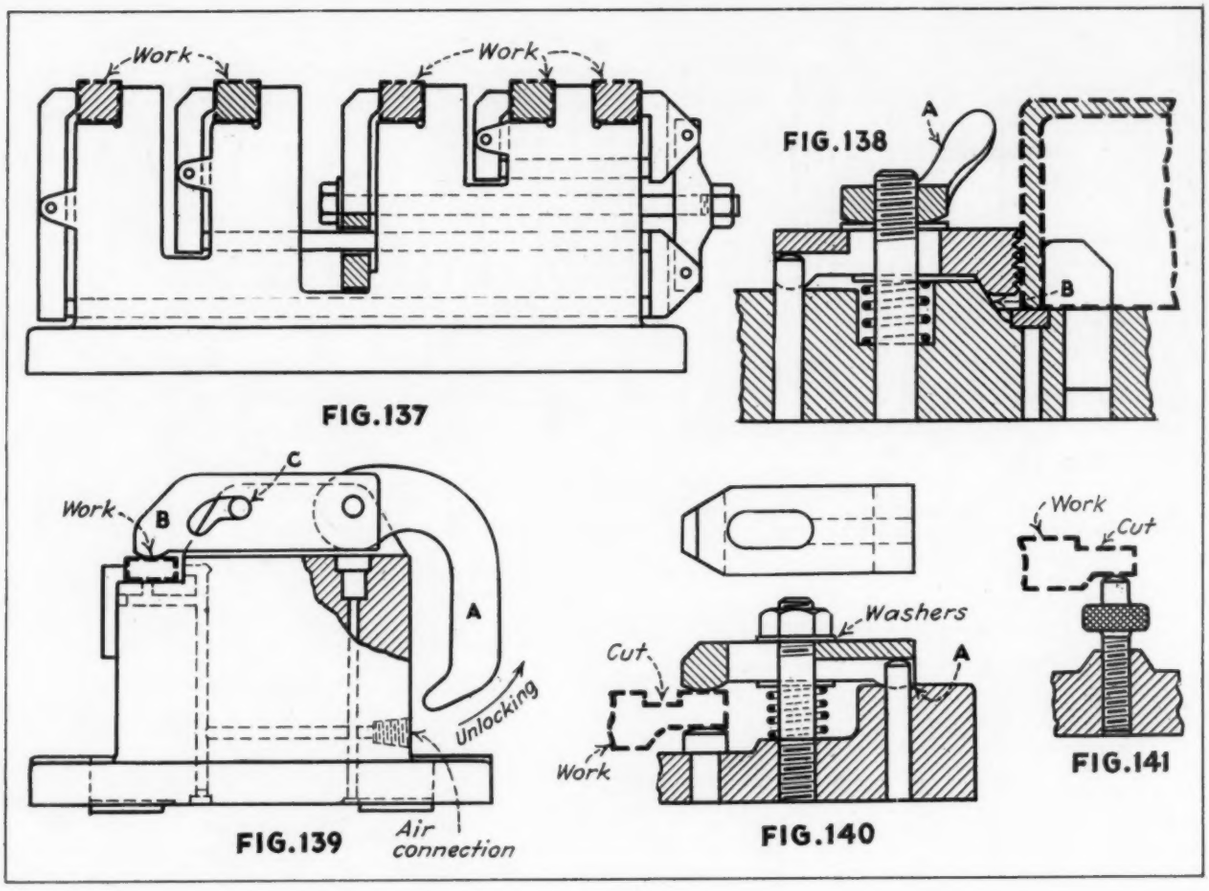
Fig. 136 shows a section through

Fig. 132—Work not exactly parallel is clamped, centered and equalized by secondary jaws B and C, because jaw C is free to turn on arc E. Fig. 133—Details of the secondary jaws

Fig. 134—Tongue A will be centrally located on the piece, regardless of width variations, by the action of the rocker jaw B

Fig. 135—Up to 40 pieces have been clamped in a double row in a fixture such as this one

Fig. 136—A multiple clamping action is obtained by a set of rollers below equalizing pins, the rollers being operated by a single wedge and screw



a multiple set of steel roller equalizers confined in a chamber, and operated by a single screw. The same action can be obtained if heavy grease or soft soap is substituted in place of the rollers. Milling jaws are practical which employ the latter principle with pins for holding work which has a slightly irregular contour. Shouldered heads on the pins are a sliding fit within the jaw chamber. The chamber is air-tight and packed with heavy grease, and the outer ends of the pins contact and clamp an irregularly shaped piece when the jaws are closed upon it. The clamping action of the pins is equalized on the work by the grease pressure.

Fig. 137 shows the surprising extent to which compound equalizing clamps, operated by tension and compression rods, can be carried. Five pieces, varying in thicknesses, are securely held by tightening a single nut. It is also possible to compound this design still further, if necessary in practice.

Fig. 138 illustrates, in principle, a milling clamp that moves against the work in two directions simultaneously. When the nut lever *A* is tightened, angle *B* moves the serrated nose of the clamp against the work, and forces the clamp *down* at the same time. This type of clamp has extra efficient holding power, and when it can be used, is always sure to register the work against both the vertical and horizontal stops, if the fixture is kept clean.

A cam-actuated clamp and fixture for straddle milling is shown in Fig. 139. The fixture body is of cast iron. This design is popular for milling small work because of its great simplicity and speed. Pulling out the cam handle *A*, unlocks the clamping jaw *B*. Continuing the pull elevates the jaw above and behind the work by means of the angular slot around fulcrum pin *C*. A compressed air connection is made, as shown, for ejecting the work automatically by the movement of the jaw, which trips an air valve at the moment the work is fully cleared. The air jet also clears chips from the gaging faces.

A typical design for a milling clamp is given in Fig. 140. At point *A* is a shallow arc in which the clamp base rests. In this position the clamp will not "creep" when tightening the nut. It is thus located each time in the same position. This feature further assures that the clamping end will always clear the cutters and cut. Clamps are made in widths, lengths and thicknesses, to suit individual work pieces.

The screw jack sketched in Fig. 141 is used for supporting cuts along the edges of heavy elevations in pieces milled. It is sometimes used at an angle, under the work, for a brace support towards the cutting thrust, and at other times for moving and registering the work in contact with the fixture stops. It may be used in meeting all three of these conditions in one fixture.

Fig. 137—Tightening one nut causes five pieces of varying thickness to be held by compound equalizing clamps operated by rods

Fig. 138—Work is registered against horizontal and vertical stops by a single nut lever A, which causes the clamp to ride downward and sideward on the inclined surface B

Fig. 139—Clamping jaw B is lifted up and drawn back from the work by the action of the cam handle A

Fig. 140—Arc A prevents the clamp from creeping, so that it always clears the cutters and the cut

Fig. 141—Screw jacks should always be located within convenient reach

---

Part XVIII of Mr. Hinman's series on tool design will appear in an early number.

IDEAS FROM PRACTICAL MEN

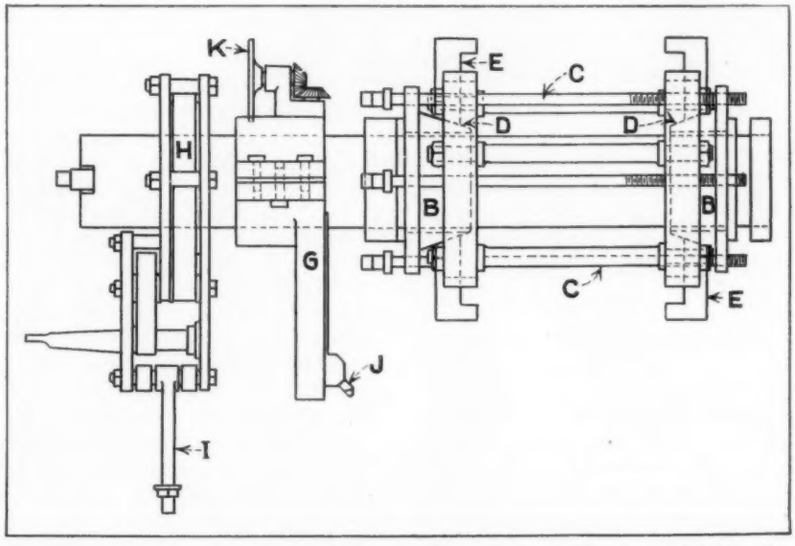
Cylinder Facing Rig

CLIFFORD H. FRENCH

Facing the end of a locomotive cylinder without removing it, is done with the special boring bar arrangement shown. This is a substantially built device with a 6-in. central bar that revolves in suitable bearings at each end. These bearings *B*, are supported in end pieces with adjustable centering jaws. The end plates are tied together by spacing bars *C*. The bearing supports have coned outer surface *D*, which secures uniform adjustment of the jaws *E*, that center the whole bar in the cylinder.

Clamped to the boring bar is a tool head G and a ring driving gear inside the case at *H*. The bar is driven by an air or electric motor attached to the taper shank carrying the drive pinion, the motor speed being reduced through the gear train. The link *I* is fastened to any suitable support to prevent the driving mechanism from turning with the bar.

The facing tool *J* is fed across the cylinder face by the handwheel *K*, operating through the bevel gears shown. The main bar is of open hearth steel, while the feed screw is tool steel with six Acme threads per inch. The gearing is all covered to insure safety to the operator. No details are given, as the construction can be seen clearly from the assembly drawings and the dimensions can be varied to suit the particular work in hand.



Jaws E center the whole boring bar rig in the cylinder while the end is faced

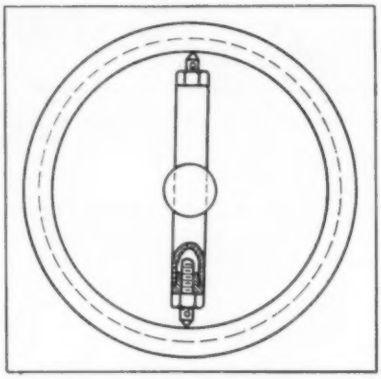
Adjustable Centering Bar

H. L. WHEELER

In laying out cylinders in locomotive and engine shops it is necessary to use centering bars to establish the center lines, either for machining or checking the castings before they are machined.

The customary method of wedging a stick in each end of the bore and tacking a piece of sheet metal in the center upon which to mark the true center of the cylinder may be warranted in shops that have only an occasional job of the kind, but where cylinders are an item of daily production, the stick method has its disadvantages. In one shop, centering cylinders is expedited by the use of the adjustable centering bar shown at the right.

A piece of pipe of suitable size



A piece of pipe plugged at the ends, fitted with sharp-pointed setscrews and having a disk welded in the center, makes an excellent centering bar

and length is fitted with steel plugs pressed in the ends. The plugs are drilled and tapped to receive pointed setscrews that will dig into the inner wall of the cylinder when screwed outward, and locknuts are provided to lock them in place. In the lengthwise center of the pipe a sheet-metal disk about 2 in. in diameter and $\frac{1}{8}$ in. thick is welded flatwise. When the disk becomes badly defaced by center-punch marks, it can be removed and another disk welded in place without very much trouble.

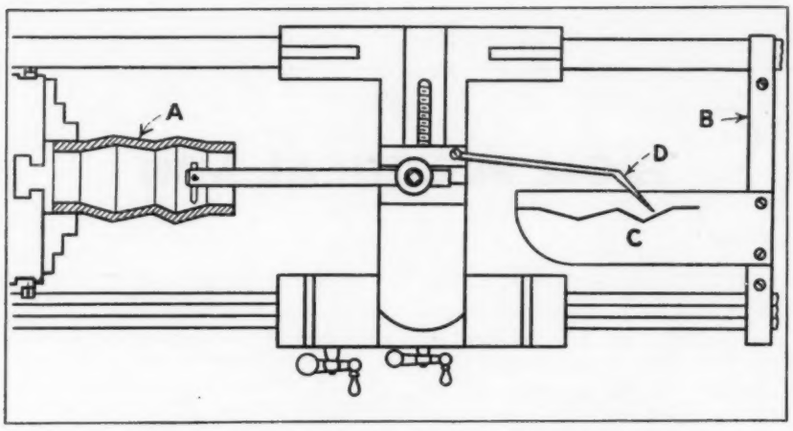
Blind Contour Boring

E. L. CANDLER

Several cylindrical castings of irregular shape exceeded the specified weight allowance and it was necessary to reduce the wall thickness by boring. The casting, *A*, was chucked in a standard lathe and a standard boring bar was mounted in the tool slide.

The bar *B* was attached to the lathe bed in such a position that the line scribed on plate *C* had the correct relation with the contour of the casting. Pointer *D* was attached to the tool block.

In operation, the longitudinal feed was engaged and, by manipulating the cross-feed, the pointer was kept on the scribed line on the plate,



By manipulating the cross-feed while the longitudinal feed is engaged, the pointer is kept on a line scribed on a stationary plate

causing the tool bit in the boring bar to follow the inner contour of the casting and reduce wall thickness.

Protecting Tools From Rust

C. A. MOWREY
DuMaurier Company

We find it necessary from time to time to protect our machines, tools, jigs and fixtures from rust by coating them with a thin film of oil. We do the work quickly by applying the oil by means of an ordinary garden spray-gun, obtainable anywhere for 25 cents.

With the gun filled with a light motor oil, such as 10-W or 20-W, the oil can be sprayed to reach surfaces that are inaccessible to an oily rag or piece of waste.

Auxiliary Faceplate

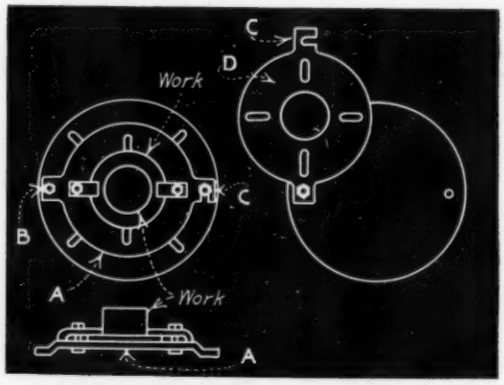
H. MOORE
Leeds, England

In boring or internally threading a part to fit a long shaft or tube it is sometimes advisable to try the parts together for a fit before removing the part being bored or threaded from the faceplate. In many cases that cannot be done because of interference of the long part with the tailstock.

To obviate the difficulty we made the auxiliary faceplate *A*. It carries the part to be bored or threaded and is attached to the regular faceplate by bolts, one of which fits snugly in a reamed hole in the lug *B*, while the opposite lug *C* is slotted to permit the auxiliary plate to be swiveled on the other bolt as a center.

When the parts are to be tried together, the nuts on both bolts are slacked off and the auxiliary plate is swiveled as at *D*. The nut on the pivot bolt is then tightened to hold the plate in its "off" position. In this position the long part can be tried in the part clamped to the auxiliary plate without interference from the tailstock.

In bringing the auxiliary plate back to its former position, the nut on the pivot bolt is slacked off and the plate is swung back so that the slot in lug *C* engages the bolt on that side. Both nuts are then tightened.



The work is clamped to the auxiliary faceplate which can be swung out of position for trying the parts together without interference from the tailstock

"Barrel" Drift Pin Enlarges Tubing

J. J. HILL

Not long ago we had to make several mild-steel bushings 4 5/16-in. outside diameter, 3 15/16-in. inside diameter and 6-in. long. Ordinarily, such bushings were whittled out of solid scrap pieces of shafting, railroad car axles and similar stock. The last time this job came in we were all out of this stock.

We use large quantities of 4¼-in. outside diameter, 3 15/32-in. inside diameter seamless, cold-drawn steel tubing. We cut this tubing in 6¼-in. lengths, to allow for squaring the ends in the lathe after the diameter had been enlarged, as it will be noted that this tubing lacked 1/16-in. of being the required finished size outside.

I told one of the mechanics to take a piece of shafting about a foot long and turn it to a shape similar to a boilermaker's "barrel" drift-pin, that is, smaller at both ends, and barrel shaped, and turned to 3 19/32-in. at the large diameter.

My intention was to run a ⅛-in. milling cutter through one side of this tubing and then force the barrel pin into the bushing by means of a hydraulic wheel press. Then I expected to use a generous application of the hammer and perhaps a little cussing to coax this bushing to retain its enlarged diameter, later filling in the milling cutter slot by means of arc welding before machining the bushing to size. That is where I ran into an amusing and pleasant surprise.

Not being overly optimistic about the outcome of this experiment, I did not say anything to the mechanic about all the slitting and slugging in store for him, figuring that he would find all this out at the proper time. Imagine my surprise, upon my return to the shop a few hours later, to find him with one of these bushings in the lathe, boring it out to the required 3 15/16-in. diameter. I do not know yet what kept me from bawling him out for doing such a thing, as there was no indication of welding in the bushing.

Pretending not to be much concerned, I asked him in an off-hand manner how he was getting along. To this he replied: "That stunt sure worked fine. It only took about 25 tons to stretch them enough to finish to 4 5/16 in. outside." Feeling a little foolish, I talked with him long enough to discover that he had gained the impression that this was the method I had been trying to get across all the time. Upon further questioning, I learned that he had smeared the pin and the inside of the bushing with white lead, and then forced the pin through without slitting. This resulted in considerable time saving.

Taking Up Spindle Wear in a Drill Press

GEORGE H. COOPER

While the alteration described by L. F. Southwick in an article under the above title (*AM*—Vol. 81, page 618) is good in itself, to my mind it brings out the relative cost of the work as compared with the value of the old machine.

The time spent in making the alteration is just as valuable as the time spent in gaining income. The description of the original wear indicates the better policy of replacing the old drill press with a new one of modern design. One rarely realizes the handicap he has been working under until he actually uses a modern new machine and finds out for himself how much more and better work it does.

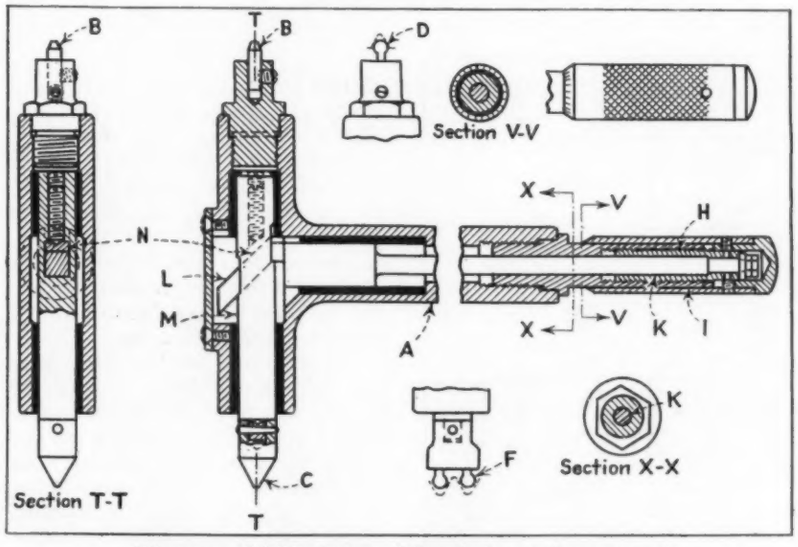
Inside Micrometer

J. R. WHITTLES

The inside micrometer illustrated is intended for measuring the diameters of holes of considerable size and depth. The body *A* is T-shaped and is made of aluminum alloy for lightness. All rotating and sliding parts are steel. By removing the contact points *B* and *C* and attaching the ball-shaped points *D* and *F*, the pitch diameters of internal threads can be measured.

The gage is adjusted by the usual graduated thimble common to all micrometers. The micrometer screw *H* is attached to the thimble by a dog-point setscrew and engages the threads in the bushing *I*. Rotating the thimble moves the stem *K* axially. Its inner end *L* is machined at an angle of 45 deg. and engages a rectangular hole of the same angle in the plunger *M*. Backlash is prevented by the gib *N* which is adjusted by a gib screw.

It will readily be seen that owing to the end of the stem and the hole it engages being at an angle of 45 deg., the plunger *M* will move in or out the same distance as that traveled axially by the stem *K*, as registered on the thimble graduations.



Diameters of fairly large and deep holes can be measured by this inside micrometer. The pitch diameters of internal threads can be measured by attaching special points

Grinding Drills for Plastic Compounds

CHARLES H. WILLEY
Superintendent of Manufacturing
Hoyt Electrical Instrument Works

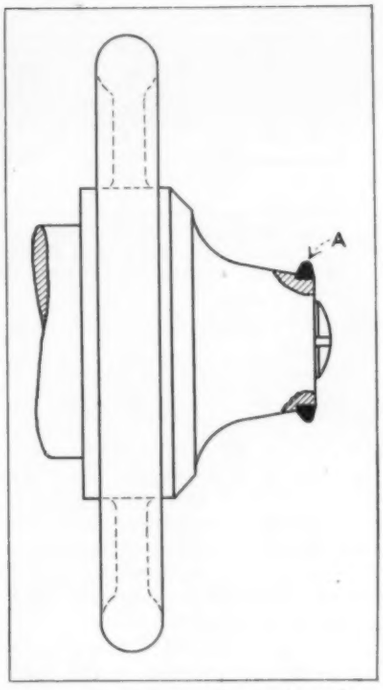
No doubt many of the readers who have had to drill Bakelite and other resinous compounds have found that it requires a drill having the point ground to an acute angle to drill clean holes without tearing or chipping at the start or when the drill comes through.

We have found that regular twist drills ground to an included angle of about 60 deg. work very satisfactorily, and that the nearer the very tips are to a needle point the better.

Preventing Coolant From Splashing

J. HOMEWOOD

In using coolant or cutting compound in cutting off stock close to the nose of a Sjogren draw-in chuck, the coolant crept up the chuck body to the operating wheel from which it was thrown off by centrifugal force, splashing and making a mess.



The ring prevents the coolant from creeping up the body of the chuck and being thrown off the operating wheel by centrifugal force

To remedy the condition I turned down the nose of the chuck and pressed on the steel ring *A*, as shown in the illustration. The ring prevented the coolant from creeping up the chuck body, and it was thrown off with much less force than from the operating wheel, due to the smaller diameter of the ring.

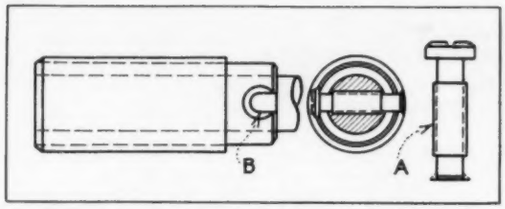
Attaching Shell Reamers to Their Bars

W. M. HALLIDAY
Millfield, Peterborough, England

In using a shell reamer that is prevented from turning on its bar by the usual pin in the bar engaging a slot in the rear end of the reamer, trouble is sometimes experienced by the reamer coming off the bar in withdrawing it from the hole. If the hole is a deep, blind one it may be difficult to get the reamer out.

To overcome the trouble there has been developed a method by which the special screw *A* is used instead of a pin. The screw has a thin head and is reduced to the root diameter of the thread under the head and at the end, the thread being in the middle.

The bar is drilled and tapped for



A special screw is used instead of the usual pin. Turning the screw until the head bottoms in the counterbore locks the reamer

the screw, which should be a snug fit therein.

Before the reamer is hardened it is drilled and then counterbored on both sides, one counterbore being for the head of the special screw, while the other is to permit the end to be slightly peened over to prevent it from being completely withdrawn from the bar. One side of the drilled hole is cut away to form the open-end slot *B* in which the reduced parts of the screw engage.

Backing out the screw a few turns will bring the underside of the head clear of the counterbore and the reamer can then be driven off the bar. Turning the screw so that the under side of the head bottoms in the counterbore, locks the reamer so that it cannot come off the bar. This method can be used with shell reamers having either straight or taper holes.

Universal Gage for Center Distances of Holes

GEORGE J. BELBES

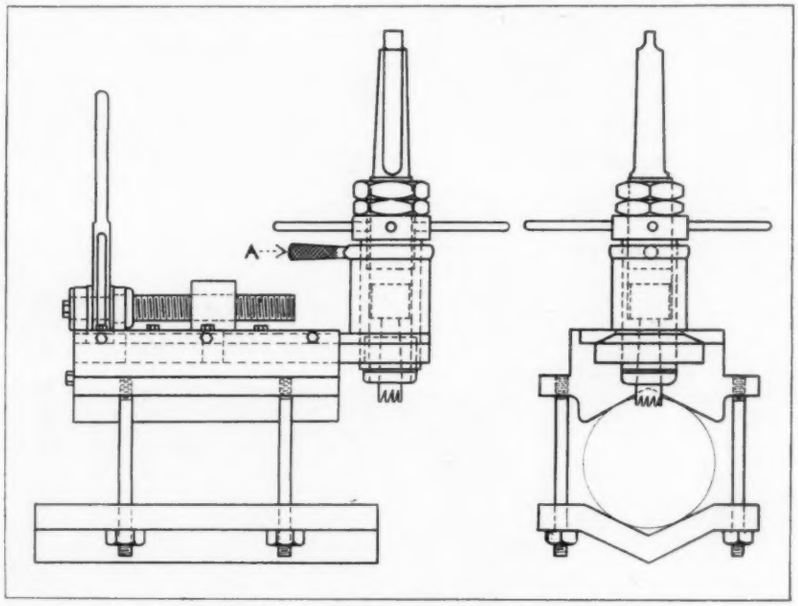
When production does not warrant having a gage for checking the center distance of holes in each component, it is necessary to provide some sort of universal gage for the purpose. One type of such a gage is illustrated herewith. Center distances can be obtained very quickly through this device.

The inner faces of the base are ground at right angles with each other and lengthwise slots *A* reduce both the contact surface and the weight. Slots *B* and *C* provide means of clamping and adjusting the V-blocks in which the gaging pins are held. By loosening nuts *D* the V-blocks may be moved so that the gaging pins will be at any desired center distance within the range of the gage. Gaging pins of different diameters to suit the work may be held in the V-blocks.

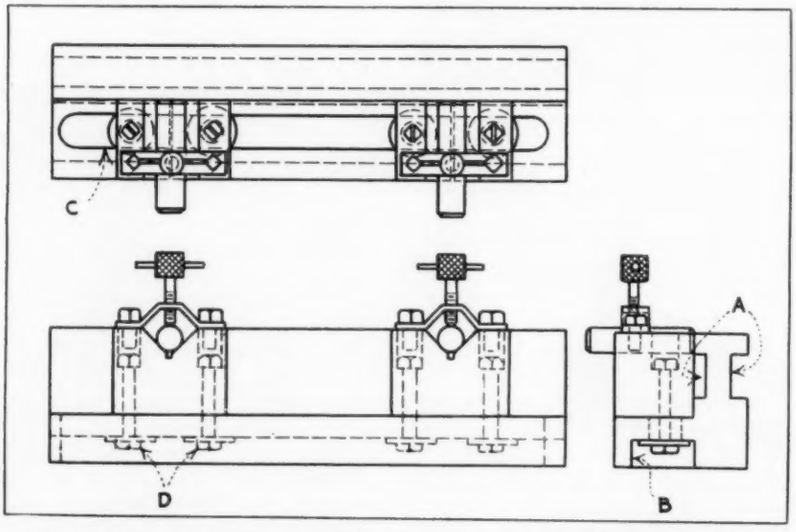
Portable Keyseat Miller for Valve Motions

CHESTER H. FRANKLIN

Cutting the keyseats in crankpins can be done in various ways. But keyways for the so-called half-crank, or return-crank, used in the Walschaert and other radial-valve motions, must be cut in just the right angular location to give the correct valve operation. For this reason the keyways are usually cut after the crankpin is in position.



Keyseats are cut in the crankpins at just the right angular location



Gaging pins of various sizes can be clamped in the V-blocks which can be adjusted for any center distance within the range of the gage

The portable keyseat miller used by the Chesapeake & Ohio Railway is shown. A sliding arm, carrying a vertical spindle at one end, is held in a suitable housing that is clamped to the crankpin by side bolts as shown in the end view. The longitudinal feeding is done by a 1-in. feed screw having twelve threads per inch, this being operated by a ratchet that can be worked in either direction.

Cutters with a standard taper shank are held in the lower end of the spindle and the depth of cut is controlled by another 12-pitch screw operated by $\frac{3}{8}$-in. cross handles. The screw can be locked in any position by the ring *A*. Power is supplied direct to the spindle by an air motor driving the taper shank at the upper end. The device is easily applied to the crankpin and as easily removed.

Characteristics of Meehanite Metal

MEEHANITE metal is a processed high-test cast iron available in a number of different grades for such service qualities as: combined strength and toughness, corrosion and acid resistance, abrasion and erosion resistance, pressure tightness, exceptional resistance to shock and stress, and intense hardness by chilling or heat-treatment. The desired properties are imparted by processing the metal according to practices developed and controlled by the Meehanite Metal Corporation and licensed to commercial foundries throughout the country. That company has furnished the following information which supersedes an earlier Reference Book Sheet (*AM*—Vol. 70, page 897).

In Meehanite there is accurate deposition of graphite in a carbide base. The graphite in minute, curly form is dispersed uniformly in a sorbo-pearlitic matrix, whereas in ordinary cast iron there are large flakes of graphite dispersed non-uniformly. As a result of the controlled structure of Meehanite, the accompanying table shows physical properties much in excess of those for ordinary cast iron. Data on cast steel and semi-steel are included for comparative purposes.

Processes by which Meehanite is controlled are known as A, B, C, D, and E, for example. The irons are also classified according to the intended service such as: general engineering castings, wear-resisting castings, heat-resisting castings and corrosion-resisting castings. (Next page).

Machining Properties

While machining in a manner similar to gray iron, Meehanite is free from white edges and hard spots. It costs approximately 25 per cent less to machine than soft steel castings. The same types of tools are used as for cast iron, and the same finishing allowance should be the same. Machined surfaces should preferably be designed so that they may be cast in the drag side of the mold. Where the finished surfaces must be cast in the cope, extra finish allowance should be made.

Wear Resistance

Wear-resisting properties of Meehanite are obtained by chilling, by heat-treatment or by casting in sand to a specified hardness. In chilling, the depth and hardness of the outer zone can be adjusted to meet service conditions, the hardness ranging up to 550 Brinell. Through heat-treatment of a suitable grade, a casting may be hardened through its entire section to 600 Brinell. Controlled sand castings will achieve any hardness up to 500 Brinell.

Comparative wear tests of various materials are:

Materials	*Loss in grams*
Manganese Steel	14
S.A.E. 3450 heat-treated	26
Steel Castings, Class H, 0.3-0.4 Carbon	104
Semi-steel	85
Meehanite A	15
Meehanite A, heat-treated	5

Erosive wear is caused by impingement by water, fluids carrying solids in suspension, and by high pressure from collapsing cavities. Comparative losses in weight of several materials under test were:

Materials	*Loss in Weight Per Cent*	*Brinell Hardness*
0.4 carbon steel (forged)	1.0	145
Stainless steel	0.7	258
Meehanite A	0.79	207
Meehanite M	0.80	227

Sliding Friction

The coefficient of friction of Meehanite is favorable to long life in gears and sliding members. Al-

General Engineering Specifications

Meehanite Process	*Tensile (lb. per sq. in.)*	*Transverse Strength lb.*	*Deflection (Inches)*	*Brinell Hardness*	*Compression Strength (lb. per sq. in.)*	*Modulus of Elasticity*	*Fatigue Strength (lb. per sq. in.)*	*Co-Eff. of Friction Against Steel*	*Specific Gravity*	*Minimum Section for Small Castings*
"A"	50,000 — 75,000 Heat Treated	5500	0.16 to 0.20	196 to 500 — to 600 Heat Treated	175,000	21,000,000	22,000 — 28,000 Heat Treated	0.1959	7.43	3/8"
"B"	45,000 — 60,000 Heat Treated	5000	0.18	196 to 450 — to 500 Heat Treated	160,000	19,000,000	19,000 — 23,000 Heat Treated	0.1853	7.37	1/4"
"C"	40,000	4500	0.17	196 to 450	150,000	17,000,000	17,500	0.1748	7.25	3/16"
"D"	35,000	4000	0.17	175 to 450	135,000	15,000,000	15,000	0.1695	7.13	1/8"
"E"	30,000	3800	0.15	140 to 450	120,000	12,000,000	13,700	0.1651	7.02	Any Size
Cast Iron and Semi-Steel	22,000 — 30,000	2500 to 3500	0.15	140 to 450	110,000	7,000,000	12,000	0.1876	7.02	....
Cast Steel	65,000	5200	0.20	165	95,000	29,000,000	27,000	0.2804	7.90	....

Characteristics of Meehanite Metal

though the coefficient of friction of this material against steel is conservatively stated below as 0.19 in., in some grades the coefficient is as low as 0.1695.

Coefficient of Friction

Meehanite A to Meehanite A	0.24
Meehanite E to Meehanite E	0.16
Meehanite A to steel	0.19
Cast iron to cast iron	0.26
Steel to steel	0.29

Cast-to-form dies made of Meehanite allow economies in construction and finishing. The initial cost of tooling is thereby considerably reduced. Process A, B and M irons are suited to drawing and forming operations on sheet metal, and to certain hot forming and forging jobs. Fenders and body sheets of automobiles have been produced in runs as high as 120,000 pieces.

For every type of cast iron there exists a minimum temperature of growth, and irons heated above this temperature assume a permanent increase in volume. The effect of successive heatings and coolings is cumulative. Some cast irons grow as much as 50 per cent or more.

For average cast iron and semi steel the minimum temperature causing growth is 660 F. when steam, corrosive liquids or gases are present, and may be as high as 1,000 F. if atmospheric conditions alone prevail. Meehanite processes A, B, and C cause resistance to penetration of steam and gases, and provide irons that do not show growth at the lower temperature and only approximately one-twentieth of that for cast iron at 1,200 F.

The heat-treatable Meehanite is a comparatively new grade which has a tensile strength of over 70,000 lb. per sq. in., and an elastic limit over 50,000 lb. per sq. in. The hardness may be from 270-350 Brinell after oil quenching and drawing at 900-1,100 F, and the Charpy impact resistance over 11 ft.lb. This material then machines at 35 to 40 ft. per min., using high-speed steel cutting tools, and takes a mirror-like polish. In the grade intended for nitriding a Brinell hardness of 870 has been obtained.

Wear-Resisting Castings

Type WA—Machinable and having a tough, dense, uniform structure. Suitable for brake drums, cams, dies, sheaves. Tensile strength, 50,000 lb. per sq. in.; hardness, 196-321 Brinell.

Type WB — Non-machinable with wear-resisting properties comparing favorably with manganese steel. Tensile strength, 38,000 lb. per sq. in.; hardness, 350-550 Brinell according to requirements.

Type WBC—Chilled. Castings have a hard exterior with depth and hardness adjusted to meet individual requirements, giving a resultant hardness up to 550 Brinell. Exterior does not spall or chip.

Type WAH—Heat-treated. This material may be oil-quenched but a water quench gives a higher hardness. Metal can be machined before being hardened for such applications as bearing bushings, gears and cams, and has good wear-resisting qualities. Tensile strength, 70,000 lb. per sq. in.; hardness, 200 to 600 Brinell.

Heat-Resisting Castings

Type HA—Intended for temperatures up to 1,200 F. and maintains some strength at temperatures up to 950 F. Withstands high pressures and resists penetration of steam and gases up to 1,000 F. without deterioration. Tensile strength, 50,000 lb. per sq. in.; free machining; hardness, 196-240 Brinell.

Type HR—Intended for temperatures up to 1,550 F. An abrasion-resisting metal of high rigidity and non-growing up to 1,550 F. Highly resistant to scaling. Typical applications: furnace and burner parts. Tensile strength, 40,000 lb. per sq. in. Hard machining and special high speed steel or tungsten-carbide tools must be used. Hardness, 300 to 400 Brinell.

Type HB—For temperatures up to 1,600 F. A dense, abrasion-resisting metal, non-growing up to 1,600 F., and intended for long life. Carbides in this iron are stabilized to prevent immature deterioration and scaling. Typical installations: furnace and stoker parts. Tensile strength, 38,000 lb. per sq. in., machinable with tungsten-carbide tools; hardness, 350-500 Brinell.

Type SC—For temperatures up to 1,650 F. Where temperatures are fairly constant material scales slowly. Typical applications: Annealing boxes, furnace rails, special fire grates. Tensile strength, 27,000 lb. per sq. in. Machinable at medium speeds and feeds; hardness, 200-300 Brinell.

Type HE—For intermittent high temperatures. Recommended for castings alternately heated and cooled, causing mechanical deterioration and breakdown of ordinary castings. Typical installations: slag pots and furnace castings. Tensile strength, 30,000 per sq. in.; free machining; hardness, 170-220 Brinell.

General Engineering Castings

Type GD—Freely machinable and recommended for bearings and for pressure castings to 250 lb. per sq. in. Tensile strength, 33,000-38,000 lb. per sq. in.; fatigue strength, 15,000 lb. per sq. in.; modulus of elasticity, 15,000,000 lb. per sq. in.; coefficient of friction (against steel), 0.1695; compressive strength, 135,000 lb. per sq. in.; transverse strength (1.2 in. bar, 18 in. supports), 2,500 lb.; hardness, 193 Brinell.

Type GC—A dense easily machinable iron for high quality castings and high pressure work. Tensile strength, 38,000-42,000 lb. per sq. in.; fatigue strength, 17,500 lb. per sq. in.; modulus of elasticity, 17,000,000 lb. per sq. in.; Coefficient of friction, 0.1748; compressive strength, 150,000 lb. per sq. in.; transverse strength, 2,800 lb.; hardness, 207

Type GB—A general utility metal combining high tensile strength, toughness and impact properties, together with wear resistance and high damping capacity. Dense and recommended for high pressure work at temperatures up to 750 F. Tensile strength, 42,000-46,000 lb. per sq. in.; fatigue strength, 19,000 lb. per sq. in., 23,000 per sq. in., in heat-treated condition; modulus of elasticity, 19,000,000; coefficient of friction, 0.1853; compressive strength, 160,000 lb. per sq. in.; transverse strength, 3,000 lb.; hardness, 212 Brinell.

Type GA—Tensile strength, 50,000 lb. per sq. in.; fatigue strength, 23,000 lb. per sq. in.; modulus of elasticity, 21,000,000 per sq. in.; coefficient of friction, 0.1959; compressive strength, 175,000 lb. per sq. in. Transverse strength, 3,500 lb.; hardness, 232.

Type GM—May be oil-hardened with little or no distortion. Tensile strength, 50,000-60,000 lb. per sq. in.; fatigue strength, 25,000 lb. per sq. in.; modulus of elasticity, 23,000,000; compressive strength, 210,000 lb. per sq. in.; transverse strength, 3,500 lb.; hardness, 241 Brinell.

Type GAH—Intended for heat-treatment, may be oil or water hardened by a simple quench with very little distortion. Tensile strength more than 70,000 lb. per sq. in.; fatigue strength, 28,000 lb. per sq. in.; modulus of elasticity, 28,000,000 lb. per sq. in.; compressive strength 250,000 lb. per sq. in.; transverse strength, 3,800 lb.; hardness, 250-600 Brinell as desired.

INDUSTRIAL REVIEW

NO considerable change is reported by the major industrial machinery markets of the country. Where conditions have been good, they remain that way, where slow the tendency is to drop off some. Few opinions are hazarded concerning the reasons for the present situation. Labor is generally quiet and the political outlook appears no more disturbing. Presumably the natural upward trend will continue, with better business in prospect.

NEW ENGLAND has been getting some good orders in the past two or three weeks, particularly for the heavier classes of machines. Conditions reported by New York are highly satisfactory, and the stock market recession has not affected buying.

PHILADELPHIA has experienced a slowing down, and there is little prospect of an immediate pick-up. On the other hand, inquiries in the Pittsburgh area continue in good volume, and the expected upturn in orders following vacations has begun to develop. September will probably be a good month.

CLEVELAND describes business as "horrible," and finds that September brought a real drop in the recession under way since April. New orders are holding up in Cincinnati and improvement is looked for if the current general upward trend of business continues. Labor conditions in Toledo are quite good and there is still considerable inquiry for machine tool equipment. Orders are not being placed, however, in quite the same volume.

DETROIT says there has been considerable quietness, but is taking it for granted that the motor car industry will get busy soon on the big year expected in that field. Inquiries are good, and general improvement is looked for by next month. Early September has brought better business to Chicago, orders emanating from all parts of the country. Orders have dropped off considerably in Milwaukee, and inquiries also. St. Louis is slow, both in regard to inquiries and orders, but small tools are fairly active.

WEST COAST dealers find no upturn from the drop experienced in August. Unhappy comparisons are being made with the record business getting under way a year ago at this season. No real improvement is expected within the next two months. The teamsters' strike centering in San Francisco is preventing the movement of cargo, and has forced some firms to cancel orders. Douglas Aircraft plans enlargement, and the Armstrong Cork Co. is scheduled to build a $1,000,000 linoleum factory in Los Angeles. Although business feeling is not optimistic, there is little of the deeper brand of pessimism.

CHIPS

Washington

Roosevelt's warning to Americans in China to get out brings sharp protests from those having heavy holdings there, many missionaries feel their duty holds them at their posts . . . Navy bulletin warns American ships of submarine menace to commercial shipping in Mediterranean . . . Commerce Department reports that labor will receive more of the national income this year than it ever did before . . . Financial weakness of shipping companies threatens federal subsidy program . . . Black's alleged Ku Klux Klan membership creates furor in Washington . . . President bars munitions from government-owned ships headed for China or Japan, informs private ships they carry such cargo at own risk . . . C.I.O. and A.F. of L. fight for labor post vacated by McGrady.

Finance

Stock market stages biggest drop since 1933 on Italy-Soviet war scare, repeats on domestic business uncertainty . . . Federal financial authorities meet to consider what to do about threat to easy money policy, release $300,000,000 from gold sterilization fund . . . Stocks drop further and then recover . . . Optimistic Roper statement halts rally.

Foreign

Soviet foreign office accuses Italian submarines of sinking Mediterranean freighters, names culprits and demands redress . . . Italy denies accusation and refuses to join parley called by Great Britain to stop such depredations, Germany stands with Italy . . . Schacht's retirement from Nazi economic leadership is rumored again . . . Goering may succeed Hitler . . . Nyon parley agrees to police Mediterranean, France and Great Britain to contribute 25 and 35 destroyers respectively . . . Soviet "purge" gets down to the little grafters, "free" election will have no anti-Stalin candidates . . . China issues appeal to League of Nations, withdraws Shanghai defenders beyond reach of Japanese naval guns . . . Franc falls to 11-year low as support is withdrawn.

Industry

N.L.R.B. opens Bethlehem Steel hearings at Johnstown refusing company's request for additional time to prepare case . . . British labor in convention aims to strive for American standards of 40-hr. week and vacations with pay . . . Homer Martin bars Communists from acting as organizers in U.A.W., says they can be members only . . . Frigidaire goes into production on electric ranges . . . B. & O. cuts force in Baltimore shops . . . San Francisco C.I.O. unions form council to fight A.F. of L. . . . Green expels Newspaper Guild, says A.F. of L. will organize own union . . . Caterpillar Tractor adds engineering and machine shop buildings costing $500,000 . . . Cost of raw materials used in automobiles up 20 per cent from 1936 average.

Indicators

Steel production declines moderately . . . Electric power output drops somewhat . . . Business Week's index recedes two points to 77.7.

Records Reveal China's '37 Imports Were Diversified as Japan Bought Machinery

WASHINGTON—Lewis M. Lind, chief, Machinery Division, Department of Commerce, summarized the machinery trade situation in the Far East in a special release to *American Machinist*.

Foreign markets for machinery follow, in the main, fairly reasonable and predictable trends from year to year. We can count on England to take a good share of many of our widely-diversified lines, Canada much construction equipment and farm machinery, while Mexico generally purchases petroleum equipment in worthwhile amounts. The Far East, however, frequently can be expected to furnish the surprises.

A year ago it was an engrossing study to note the plans for installing refrigerating machinery in India, or the industrial and agricultural experiments with air condition in Malaya and Ceylon. A little later there began a trend, not yet obvious in the statistics of international trade, perhaps, toward a very definite industrialization program in China. The United States Government had left its portion of the Boxer Indemnity Fund in China for educational purposes, and, although for awhile it was the Germans and Britons who were selling equipment in China, there came a hope that at last this country was about to gain its reward for the philanthropy of a third of a century ago.

Since this new turn was expected to be definitely the trend for some time to come, perhaps still another upset was already due. One occurred, at any rate, with the renewal of hostilities in Asia.

China's purchases of American equipment in the first half of this year reached $1,260,000, a satisfying improvement for the six months over the $1,600,000 for 1935. The nature of the purchases was healthy in its diversification as well as in its increasing volume. In the ten most important classes of machinery shipped to China were printing equipment, air compressors, tobacco machinery, sewing machines, smelting apparatus, and air conditioning equipment.

Japan, on the other hand, more than doubled its 1935 machinery purchases, and more than half was metal working equipment. While in the shipments to China the big classes were well diversified, in the case of Japan eight of the ten groups at the top of the list were machine tools. With Japan's half-year purchases of American machinery amounting to $6,644,000, machine tools represented $3,474,000 of the total.

It is of more than passing interest to note that during this last July, Japan and England together took 58 per cent of all machine tools exported from the United States. Japan's share was $570,000 and England's was $1,218,000.

Index of Machine Tool Orders

Month	Based on Volume of Shipments for 1926 Index of Orders: Domestic	Foreign	Total	3 Months' Average Index	% Foreign to Total Orders
1936 — September	82.9	35.6	118.5	132.0	30
October	105.4	31.1	136.5	127.5	23
November	110.7	36.4	147.1	134.0	25
December	205.7	52.0	257.7	180.4	20
1937 — January	156.1	44.0	200.3	201.7	22
February	122.4	42.8	165.2	207.7	26
March	172.1	39.5	211.6	192.4	18
April	232.5	50.0	282.5	219.8	18
May	161.4	47.1	208.5	234.2	22
June	137.6	54.2	191.8	227.6	28
July	115.4	55.7	171.1	190.5	32
August	129.5	50.3	179.8	180.9	28

Distribution of Orders

Average Indexes of Individual Companies Based on 1926 Level of Business	Companies In Per Cent of Total Number Reporting: 1936 2nd Quar.	1936 3rd Quar.	1936 4th Quar.	1937 2nd Quar.	1937 July	1937 August
200–up	17.2	15.8	28.4	38.5	29.9	32.3
100–199	32.6	28.8	30.2	29.1	33.6	31.6
60– 99	19.0	22.9	19.5	15.1	16.4	13.5
20– 59	21.8	21.7	15.2	11.4	11.9	15.1
Less than 20%	9.7	10.8	6.7	5.9	8.2	7.5

Boake Carter to Speak at S.A.E. Annual Dinner

Boake Carter, famous news commentator, will be the featured speaker at the annual dinner of the Society of Automotive Engineers, October 28, at the Hotel Commodore, New York, John A. C. Warner, secretary and general manager, announced.

W. J. Davidson, general sales manager of Winton Engine Corp., chairman of the Society's Engineering Relations Committee, will be toastmaster. President Harry T. Woolson is to preside at a short business meeting.

The annual dinner of the Society is one of the industry's outstanding events during National Automobile Show week. More than 1000 manufacturing executives and engineers are expected to attend.

National Safety Convention Includes Shop Sessions

Programs for the Power Press and Machine Shop Sections have been completed for the 26th National Safety Congress and Exposition being held in Kansas City, Mo., October 11-16.

October 12, 2 P.M.

Developing Safe Workers in Metal-Working Industries.

"Through the Employment Office and Job Training," H. C. Bigler, General Motors Research Laboratory.

"Through Visual Education Methods," R. H. Ferguson, Republic Steel Corp.

"Through the Regular Supervisory Force," Van B. Hunter, International Harvester Co.

October 13, 2 P.M.

"The Placement of Men from the Standpoint of Physical Fitness," Dr. Harold A. Vonachen, Medical Director, Caterpillar Tractor Co.

"Point of Operation Guards for Metalworking Machines (Other Than Power Presses)," Samuel S. Dibsdale, The J. G. Brill Co.

"Designing for Safety—Power Press Dies, Jigs, Fixtures and Tools," B. E. Rockhoff, Detroit Steel Products Co.

October 14, 2 P.M.

"Recent Developments in the Safety of Internal Transportation Equipment—Power Trucks, Hand Trucks, Cranes, Conveyors, etc.," B. F. McAuley, Western Electric Co.

"Controlling the Accident Hazards of Repetitive Operations," Dr. James S. Thomas, Chrysler Institute of Engineering.

DETROIT LETTER

Automobile output slows up in spite of few changes . . . Layoffs set new low record . . . Companies step up engine power . . . Buick using coil springing . . . Ford continues decentralization with two new plants

DETROIT—Despite the absence of major changes in 1938 models, the automobile industry is a little slow in getting production under way. Output recently has declined to the lowest point for the year and just now is beginning to rise. Buick is building over 500 cars a day and as soon as possible intends to push its assemblies up to 1,400. Plymouth, having swung over quickly to the '38 series, hopes to be making 1,000 cars a day by Oct. 1 and soon thereafter will boost production to 2,000 a day.

There have been fewer layoffs during the tooling period than ever before in history. The year's employment peak for Chrysler Corp. is reported to have been on May 20 when 77,103 people were at work. The bottom was touched on Sept. 2 with 41,428 workers. If only production men should be included in the figures, employment by the corporation totaled 48,889 on May 20 and 16,547 on Sept. 2.

Fender Headlamps

Aside from the Graham and the Lincoln-Zephyr, the new cars won't knock anyone over with surprise because of their changed appearance. The tendency is to put headlamps into the front fenders. In fact, Graham has completely recessed the lamps so that they are flush with the fender line, the first time that such design has ever been attempted. Many cars will have batteries under the hood where they are more accessible.

Cars are being stepped up in power through various engine refinements. Buick, for example, is increasing its series 40 engine by 7 hp. by the use of what it terms its "turbulator piston."

Studebaker has lowered its propeller shaft and thereby taken the hump out of its car floors by turning its transmission on its side. Buick's so-called "torque free springing" is attracting attention. It consists of two coil springs located behind the rear axle, one at each side of the car. They are secured in position vertically by a clamp and bolt, one each at the frame and axle spring seat. The new springs make possible a much better ride and increased safety. The construction is closely akin to independent springing and it would not surprise the industry if some companies in 1939 adopted independent springing on all four wheels.

Hupmobile is out with its six and light in a total of six body styles which are relatively conservative in design. The Hupp management is considering manufacture of a lower-price six next year if the public reception of its current models is encouraging. Nash, which is reported to have postponed the removal of its executive offices to Detroit until Nov. 1, has decided to enter the truck business and late next spring will place on the market a new truck to be built at its Kenosha plant.

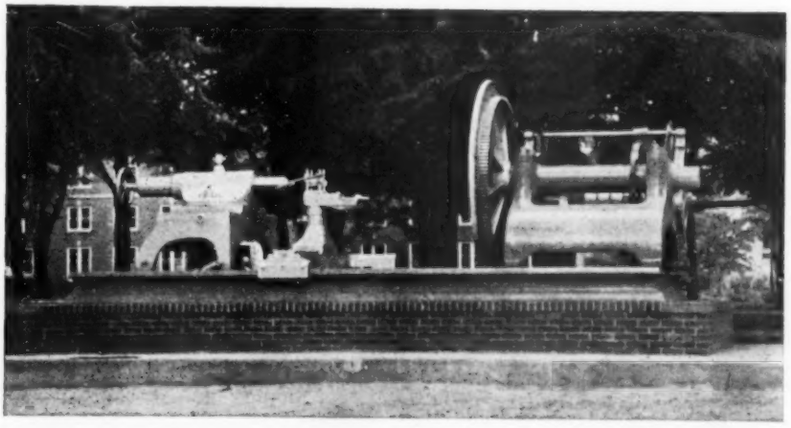
Ford is believed to have abandoned at least temporarily its plan for spending two million dollars to expand facilities for producing 60-hp. V-eight motors at Rouge. Instead it is understood to have adopted the policy of building up a large bank of the small motors, numbering 100,000 or more, which can be drawn on when assembly requirements are heavy. This is the policy long followed by Plymouth because its assembly capacity has been in excess of its machining capacity.

Lately Ford has purchased some new press equipment presumably for expansion of its body-making facilities at the Rouge plant. The report persists that Ford intends to build a larger proportion of its bodies itself. Ford is proceeding with erection of its new "village industry" at Milford, Mich., which will turn out carburetors. It likewise is contemplating construction of a new assembly plant near St. Louis on the Mississippi.

Chrysler Eastern Plant

There is nothing to the rumor that Chrysler is preparing to put an assembly plant in or near Buffalo. It is only a matter of time until Chrysler will add an eastern assembly plant, but whenever it is erected it probably will be in the Philadelphia district. Incidentally, Chrysler has increased its productive capacity by 250,000 cars for '38 and is hopeful that it may have to use it the coming season.

Though the automotive labor situation appears to be well in hand, there is an underlying feeling of tension. The United Automobile Workers have declared their intention of getting a contract from Ford "before the snow flies" and nobody knows what may happen at Dearborn.



"Age Cannot Wither"—**Although used to drill the bore of many antiquated cannon in the Confederate Gun Works at Selma, Ala., this lathe is perfectly attuned and capable of precision work today. It was recently presented to Alabama Polytechnic Institute by the Tennessee Coal, Iron & Railroad Co., subsidiary of the United States Steel Corp., and now stands near the main administration building**

Commerce and Industry Minister Yoshino (right) discusses financial aspects of five-year machine tool plan with Finance Minister Kaya

Japanese Resources Bureau Prepares for War

TOKYO—Preparations for formation of a strict wartime economic structure have been started by the Resources Bureau of the Japanese Cabinet. Faced by an eventual wholesale engagement of Japanese and Chinese forces, the Bureau is moving quickly in cooperation with other governmental divisions, including the War, Navy, Finance, Commerce and Industry, Railway and Agriculture Ministries.

Industries will be organized on a wartime basis for the manufacture of munitions on a large scale, according to the newspaper Chugai. Factories directly concerned with munitions will be placed under the direct control of the army and navy for the duration of the war. Other factories, including those engaged in the manufacture of metal-working machinery, will be placed under the control of the Minister of Commerce and Industry.

Commerce Minister Yoshino revealed that the government will act to speed up increases in productive capacity and that joint government and private commissions will be created to act as a supervisory body.

In view of the urgent demand for machine tools, the Department of Commerce and Industry will submit to a special session of the Diet a bill which will feature the following points:

1. Incorporation of large scale companies for manufacture of tools on a semi-official basis.

2. Coordination and demarcation of production of tools.

3. Encouragement of replacements with a view to promoting internal demand for tools.

4. Acceleration of the importation of tools for enhancing productive capacity.

As an emergency measure, it is proposed temporarily to abolish the import duty on tools and to grant subsidies for replacement of tools.

On Aug. 13 the Department of Commerce and Industry published regulations relating to the Official Mechanical Testing Institute. The Institute is intended to give direction to the growing mechanical industry of the country with a view to export trade. The most important feature is that the Institute may undertake on its own account the manufacture of such machinery as is developed as a result of work carried on under the direction of the Institute and is found impractical for private enterprises.

Importers of machine tools are meeting with growing difficulty in their sales. German manufactures are at least 15 per cent higher with deliveries promised in a minimum of 18 months. American machine tools are still 10 per cent higher and cannot promise delivery for 26 to 28 months.

Showa Aircraft Industry, closely affiliated with Mitsui, is placing another group of orders for machinery mostly with foreign manufacturers.

Gear Makers Announce Diversified Program

The American Gear Manufacturers Association has announced a tentative program for the twentieth semi-annual meeting which is being held at Spink-Wawasee Hotel, Lake Wawasee, Ind., September 20-22. An address by a national authority on present and pending legislation affecting industry is planned for the meeting, and the following papers are scheduled:

"Flame Hardening Method for Gears," W. E. Sykes, Farrel-Birmingham Co., Inc.

"Relation Between Microstructure and Machineability of Gear Steel," Dr. N. E. Woldman, Eclipse Aviation Corp.

"Roller Tests to Determine Pitting Fatigue Strength," Dr. Stewart Way, Research Laboratories, Westinghouse Electric & Mfg. Co.

"Electric Motors," L. R. Botsai, Nutall Works, Westinghouse Electric & Mfg. Co.

"Valuation of Jobs Based on Community Rates," A. S. Crockett, General Electric Co.

"The Credit Situation," Paul Fielding, National Credit Association.

"Our Relations With Other Associations," T. T. Rideout, Nutall Works, Westinghouse Electric & Mfg. Co.

Industrial Advertising and Sales Promotion Men Meet

The fifteenth annual Industrial Advertising and Sales Promotion Conference and Exposition is being held at the Edgewater Beach Hotel, Chicago, September 22-24. Howard Ehrlich, executive vice-president, McGraw-Hill Publishing Company, will speak on "The Greatest Sales Opportunity in at Least 23 Years." Harry Baum, Fairbanks, Morse & Co., will speak on "How We Coordinate our Sales and Advertising Activities." Discussion on this topic will be led by S. D. Mahan, Westinghouse Electric & Mfg. Co.

An interesting feature of the program is the problem clinics which are to be held on the last day of the convention. The morning has been divided into two periods and in each period at least four different problems will be covered in the form of round table discussions. E. J. Goes, the Koehring Co., Milwaukee, will lead the clinic on "Selling the Engineering Contracting Industries."

WATCHING WASHINGTON

Washington has worries without Congress . . . Klan incident will need explaining . . . Neutrality Act principles are applied to government owned ships . . . "Sterilized gold" freed to maintain easy money

WASHINGTON — Administration troubles did not disappear with the adjournment of Congress. First the white-robed figure of the clan reared its head, cast the shadow of racial prejudice across the Supreme Court bench and provided an effective lynching party for any hopes of revival of the President's court packing plan.

Appointee Black is still in Europe and has not replied to accusations originating in the Pittsburgh *Post-Gazette*. His absence and silence have given wide publicity to the question of his Klan membership. He may be able to silence his accusers, but unless he does so positively and finally, the much vaunted plan for liberalizing the Supreme Court will come to a decisive end.

Part of the original court plan opposition came from racial and religious minorities who have found from sad experience that concentration of power is always a threat to their freedom. The firm guaranty of the Constitution has proved one of the few effective instruments of equal rights.

War Worries

Another trouble is the threat to world peace. Without invoking the Neutrality Act officially, the President put its principles into effect by banning shipment of war goods to the Orient in government owned vessels. The merchantman Wichita was forced to leave nineteen Bellanca airplanes and two cases of revolvers, consigned to Saigon, French Indo-China, at San Pedro, California where it stopped to refuel. The government owns and operates about 37 ships, owns and leases a hundred or so more. The President's action in this regard indicates a middle-of-the-road course and a desire to avoid the drastic consequences of full operation of the Neutrality Act which would be decidedly disadvantageous to China.

Still another worry is the securities decline which indicates a bearish viewpoint on the part of some business interests. Much as Administration leaders may talk about putting the brakes on recovery when things are booming, they fully realized the political embarrassment incident to a set-back and are just as anxious as the business world to avoid one. The prompt action of the Treasury in freeing $300,000,000 of "sterilized gold" is a good indication of this anxiety. The hoped for result is to maintain the easy money policy of the Administration by adding this amount to Reserve Bank deposits.

Business Boosters

After scolding the stock market gamblers and boosting margin requirements, the government is actually perturbed when stock prices stopped rising and slumped. Not even in the Hoover-Mellon days of preaching prosperity from the housetops has there been a more enthusiastic claque among government officials about how splendid all the business indices are.

The truth, of course, is that the government is worried about the judgment of some big speculators that world conditions are jittery. It remembers what happened to the market and commodity prices when war broke out in 1914. It doesn't think war on a world scale is coming now—doesn't expect it until about 1939. But it might come, and it wants to have a lot of cushions to stop the impact on business during that crucial few months after war starts and before the war orders start flowing (nobody thinks any neutrality law is going to stop business after ways of getting round it are devised).

This very concern over business is having an obvious effect on members of the House and Senate, if one may judge by those still on the ground here. This means that the whole situation is drifting in a direction calculated to help the conservatives in the big battle over taxation, further regulation of business, and direction of labor policy in the next session.—Carter Field, *Washington Bureau, McGraw-Hill Publishing Co.*

One commentator blames the market decline not so much on the war scare as on rumors from Washington that a graduated corporate income tax is under consideration. The present law, as recently revised, does provide a slight sliding scale as between large and small concerns. Drastic extension of the graduated tax principle could easily spell the end of the profit system and effectually express the Administration's dislike for bigness in business.

Drive Against Surplus Tax

The next Congress, however, is likely to resist this proposal, if such seriously be made, and see in addition a real drive for sharp revision on the undisturbed corporation earnings tax. The amendment most interesting to successful corporations is that exempting a certain percentage of expenditures for purposes of expansion. (Senator Duffy of Wisconsin would allow up to 30 per cent of a company's adjusted net income.)

Advocates of change have assumed that the Administration resistance to this particular type of amendment was based on fear of loss in revenue. This is true, but only part of the truth. A more important reason is that the tax on undistributed earnings is part of Roosevelt's drive toward planned economy.

The President will turn on every possible amount of heat to prevent any deductions for expansion. This does not mean maintenance or replacements, but anything smacking of expansion runs against the grain.

The point has often been stated by the President when not talking about tax bills. He believes that much of the trouble in 1929 was caused by over-expansion of productive capacity by private business.

He wants, eventually, under planned economy to have the federal government decide whether the consumptive capacity of the country justifies any particular case of expansion in the capacity for a given product. He has illustrated his case of expansion in the capacity for a given product. He has illustrated his case often in private conversations with comparisons to the railroad situation, where the I.C.C. prevents construction of a new line in territory already amply served.

The tax on undistributed earnings was a step in this direction. It does not prevent unnecessary—from the government viewpoint—plant expansion, but it places a high penalty on it unless sanctioned by the stockholders of the enterprise.

Iron and Steel Engineers Complete Convention Plans

Plans have been completed for the annual meeting of the Association of Iron and Steel Engineers which will be held in the Stevens Hotel, Chicago, Sept. 28-Oct. 1. Twenty-five papers are scheduled for presentation by leading authorities in the steel mill industry, covering every phase of plant practice and new developments.

The Iron and Steel Exposition is being held concurrently with this convention and will display the latest type of equipment used to produce and process steel. One hundred and fifty manufacturers will participate in this show.

Inspection trips to the Indiana Harbor Works of the Inland Steel Co. and to the Gary Sheet & Tin Division of the Carnegie-Illinois Steel Corp. are scheduled during the course of the convention.

One of the highlights of the convention will occur at the banquet on the evening of Sept. 30 when tribute will be paid to the National Safety Council. The Council was founded under the auspices of the Association of Iron and Steel Engineers in 1912.

PERSONALS

R. R. DAVIS has been made assistant to the general advertising manager of Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Mr. Davis has been associated with the company since 1910.

DAVID B. CARSON and THOMAS M. GALBREATH have been elected vice-presidents, Sharon Steel Corp., Sharon, Pa. Mr. Carson has been manager of the Stainless Steel Division since 1933 and will continue to devote his time to that division. Mr. Galbreath has been general manager of sales since 1934 and will continue in charge of that division.

JULIAN L. SCHUELER, formerly superintendent, Steel and Wire Division, Continental Steel Corp., Kokomo, Ind., has been made general superintendent.

FRED A. HAHN and DEAN B. COPELAND have been named to the board of directors of the American Bantam Car Co., according to R. S. EVANS, president.

HARRY VARLEY, president, Briggs & Varley, Inc., advertising agency, has been elected president of Schick Dry Shaver, Inc., Stamford, Conn., to succeed the late COL. SCHICK.

NEWTON H. HOYT, comptroller, Singer Mfg. Co., Bridgeport, Conn., has been made works manager to succeed the late GEORGE M. EAMES. ROBERT W. STEWART, formerly assistant to Mr. Eames, has been named assistant works manager.

HOWARD V. HARDING

HOWARD V. HARDING has been appointed district sales manager in the New York territory by Lukenweld, Inc., division of Lukens Steel Co., Coatesville, Pa. His headquarters will be at 120 Liberty St., New York. Mr. Harding was formerly with Gifford-Wood Co. and later with Peter Clark, Inc.

ELIOT FARLEY, Mt. Kisco, N. Y., has been elected president of the Eagle Lock Co., Terryville, Conn., to succeed H. B. PLUMB, who has retired from active service after 60 years with the company.

FRED A. FIRNHABER, formerly on the editorial staff of *Product Engineering*, has been appointed standards engineer for the Landis Tool Co., Waynesboro, Pa.

WAYNE Z. FRIEND has joined the development and research staff of the International Nickel Co., Inc., New York.

FRED A. VOELKER has been made chief instructor of the new apprentice training school, Pontiac Motor Division, General Motors, Detroit.

CHARLES E. FOUHY, industrial relations expert, has joined the staff of the Personnel Training Division, International Correspondence Schools.

FRANK F. SLICK, general superintendent, Carnegie-Illinois Steel Corp., Braddock, Pa., has been granted an extended leave of absence due to failing health. HARRY L. BRINDLE has been appointed acting general superintendent. He was formerly assistant general superintendent of the company's operations in the Youngstown area. He will be succeeded by FRED C. LOVELAND.

J. M. J. KEOGH, assistant to the works manager, Allis-Chalmers Manufacturing Co., retired August 31 after 56 years of service.

ROGER PROSSER will continue to conduct the business of Thomas Prosser & Son at 15 Gold St., New York. Mr. Prosser formerly conducted the business in partnership with the late RICHARD PROSSER.

Exports of Machinery During July, 1937

	July 1937	June 1937	July 1936
Electrical machinery and apparatus	$10,275,037	$9,171,696	$8,042,542
Power generating machinery (except automotive and electric)	1,381,981	1,067,787	1,089,668
Construction and conveying machinery	2,175,727	2,151,078	1,185,424
Mining, well and pumping machinery	5,764,288	4,574,390	3,091,118
Power driven, metal-working machinery	4,665,741	4,731,173	2,885,815
Other metal-working machinery	439,351	360,754	276,553
Textile machinery	1,073,709	937,884	1,267,961

Exports of Metal-Working Machinery During July, 1937

	July 1937	June 1937	June 1936
Engine lathes	$388,936	$232,191	$105,843
Turret lathes	346,201	251,392	116,519
Other lathes	98,490	97,831	79,224
Vertical boring mills and chucking machines	238,970	319,097	74,178
Thread cutting and automatic screw machines	327,683	354,322	61,961
Knee and column type milling machines	199,164	226,220	129,810
Other milling machines	227,157	241,890	184,355
Gear cutting machines	84,474	287,123	154,541
Vertical drilling machines	95,218	83,850	76,824
Radial drilling machines	55,869	46,056	21,828
Other drilling machines	63,078	79,868	163,547
Planers and shapers	56,412	58,997	44,028
Surface grinding machines	128,391	79,478	57,587
External cylindrical grinding machines	39,848	112,385	74,330
Internal grinding machines	223,720	193,430	37,632
Tool grinding, cutter grinding and universal grinding machines	121,311	212,744	167,499
Other metal grinding machines	170,305	71,786	67,882
Sheet and plate metal grinding machines	284,626	282,901	328,959
Forging machinery	143,040	130,855	173,393
Rolling mill machinery	578,824	766,682	215,109
Foundry and molding equipment	95,933	85,307	79,558
Other power-driven metal-working machinery and parts	695,091	516,768	471,208
Other Metal-Working Machinery			
Pneumatic portable tools	$113,938	$116,762	$75,298
Portable and hand and foot operated metal-working machines and parts	127,481	103,709	79,778
Chucks for machine tools	25,210	21,539	13,190
Milling cutters, machine operated threading dies and taps and similar machine-operated metal cutting tools	87,497	54,664	68,313
Other metal-working machine tools	85,225	64,080	39,974

BUSINESS ITEMS

Cushman Chuck Co., Hartford, Conn., is enlarging its factory by erecting a second story addition of 7,100 sq. ft. Total cost of improvements is expected to be approximately $50,000.

International Harvester Co., 606 South Michigan Ave., Chicago, has let the contract for its new plant on Brookville Road, Indianapolis. Plant with equipment is expected to cost $3,500,000. Production is expected to begin in February.

Pittsburgh Tool-Knife & Mfg. Co., metal-cutting saws, rivet sets and other tools, Pittsburgh, Pa., has moved into its new plant at 75-81 Sycamore St., Etna, P. O.

General Motors of Canada, Ltd., plan to reopen the Regina factory on or about November 15. About 400 men will be employed on a daily schedule of 125 cars and trucks in this plant which has been idle since 1930. It is expected that $700,000 will be spent on a modernization program.

Schindler Machine Works, New Orleans, La., is moving from 623 South Peters St., to 833 Tchoupitoulas St. HENRY P. SCHINDLER is president.

Thermo Products Corp., Pittsburgh, has appointed CARL V. REILLY, 3537 Antisdale Ave., Cleveland Heights, Ohio, as sales representative in northern Ohio and the city of Buffalo.

American Chain & Gear Co., 2457 E. 57th St., Los Angeles, has been organized by C. A. NICHOLAS, R. E. DALGLEISH and T. KYLE.

Reed-Prentice Corp., Worcester, Mass., will handle the sales of plastic injection molding machines directly in the New York territory. GEORGE W. MCINTYRE, Room 1101, 75 West St., Evening Post Building, is manager.

Westcott Chuck Co., Oneida, N. Y., has added J. C. HARVEY as a special representative from the home office. Mr. Harvey will work with the Westcott distributors in the various territories.

The Emerson Electric Mfg. Company has moved its Cincinnati Office to 457 E. 6th St. JACK SEARLS will be in charge.

Whiting Corporation, manufacturer of cranes, foundry and railroad equipment, and stokers, Harvey, Ill., on August 28 presented 42 employees with gold and diamond emblems representing 25 years or more of continuous employment, 176 with gold emblems representing 10 years or more employment, and 61 employees with silver emblems representing 5 years or more employment.

Sun Machinery Co., Inc., Newark, N. J., has moved from 115-121 Hanford St., to 36 Van Vechten St.

Continental Machine Specialties Co., Minneapolis, has moved its sales and sales promotion offices to Chicago. L. A. WILKE, president, will be in charge of headquarters at 631 West 46th St., Chicago.

Thomas Truck & Castor Co., recently organized in Keokuk, Iowa, has started the manufacture of Jak-Tung trucks, formerly made by Link-Belt Co. and a complete line of other floor trucks. J. FAULKNER THOMAS is general manager.

F. E. Holtz, Inc., Milwaukee, has been formed to manufacture and deal in gears, machines, tools, etc. by FRED HOLTZ, president-treasurer, Generating Gear Co., Milwaukee. G. L. LIGHT and F. RUSSELL HOLTZ are also members of the firm.

Lane Wells Co., manufacturer of oil well supplies, Los Angeles, is building a new factory at 5610 South Soto St., to cost approximately $100,000.

Cleveland Chain Co., Cleveland, is planning a factory to cost approximately $800,000.

Marquette Metal Products Co., tool machine products and auto parts, Cleveland, plan an addition to the plant and purchase of additional machinery and equipment to cost a total of approximately $200,000.

Globe-Wernicke Co., manufacturer of steel office furniture and supplies, Cincinnati plans to construct an addition to their factory costing approximately $100,000.

General Springs Co., Cincinnati, are to build a plant costing approximately $60,000.

Overly-Houtz Co., Madison Ave., N.W. and W. 114th St., Cleveland, are to build a sheet-metal fabricating plant of approximately 12,000 sq. ft.

New Haven Clock Co. has leased a plant at Guilford, Conn., and will install equipment for production of clock parts.

Union Mfg. Co., manufacturer of chucks, face plate jaws, and chain hoists and trolleys, New Britain, Conn., has appointed Higgins & Linde, Inc., 564 West Randolph St., Chicago, as its representative in that territory.

Chicago Pneumatic Tool Co., 6 East 44th St., New York, N. Y., have opened a direct factory sales and service branch at 119 West Second South, Salt Lake City, Utah. OTTO A. RAY has been appointed manager.

The Lincoln Electric Co., Cleveland, Ohio, has appointed W. W. MCCLELLAN to the sales engineering staff of its Grand Rapids office, 314 Building & Loan Bldg., Grand Rapids, Mich.

Falk Corp., maker of steel castings, gears and speed reducers, Milwaukee, has purchased a building 114x308 feet, from the Freese Engineering Co., Chicago, which will be moved to its plant at West 30th & Canal Sts., and will be used to house all of its welding operations.

Fruehauf Trailer Co. is planning an additional 65,000 sq.ft. of floor space to furnish space for heat-treating facilities, paint spray shop, lathe and grinder divisions, a pressed metal shop, and final inspection division.

The Linde Air Products Co., unit of Union Carbide & Carbon Corp., has opened a new sales office in Oakland, Calif., at 371 San Pablo Ave.

Manufacturers & Fabricators, Inc., 4389 Martin Ave., Cleveland, Ohio, has been formed for manufacture of iron and steel products. M. SCHILLING is president.

Kelsey-Hayes Wheel Co. plans to erect a $1,000,000 plant on acreage recently acquired on Neville Island, Pittsburgh. It is expected that the plant will use 100,000 tons of flat steel annually and will employ between 1,000 and 1,500 men.

Cutler-Hammer, Electric Control Apparatus, Milwaukee, Wis., has appointed W. E. RAGSDALE, manager of the recently opened Dallas, Texas branch, 624 Sante Fe Bldg.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has appionted J. M. MCKIBBIN, JR., apparatus advertising and sales promotion manager.

OBITUARIES

EDWARD T. PIERCE, head of Morse Twist Drill & Machine Co., New Bedford, Mass., died September 10 at the age of 81.

GEORGE M. EAMES, Bridgeport, Conn., works manager of the Singer Mfg. Co., died September 4 at the age of 78.

ERNST FLENTJE, inventor and manufacturer of the Flentje double-acting shock absorbers for automobiles, died September 1. He was born in Germany 81 years ago.

G. A. BINGHENHEIMER, chairman of the board, Diamond Iron Works, Inc., and its subsidiary manufacturing division, Mahr. Mfg. Co., Minneapolis, died August 27 at the age of 70.

WILLIAM E. MARCHANT, for the past seven years active in the machinery business in Detroit, died September 4 at the age of 52. Mr. Marchant was credited with being the originator of the coach-type body.

E. J. PARKER, New York district sales manager, Morgan Engineering Co., Alliance, Ohio, died August 24 at the age of 58. He had been connected with the company for 43 years.

MEETINGS

AMERICAN GAS ASSOCIATION. Ninteenth annual convention. Cleveland, Ohio. Sep-

tember 27-October 1. ALEXANDER FORWARD, managing director, 420 Lexington Ave., New York.

AMERICAN FOUNDRYMEN'S ASSOCIATION. Midyear meeting. Columbus, Ohio. Sept. 30-Oct. 1.

AMERICAN INSTITUTE OF MINING AND METALLURGICAL ENGINEERS. Iron and Steel Division. Atlantic City, N. J., Oct. 18–22.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS. First Fall meeting. Hotel Laurence, Erie, Pa. Oct. 4-6.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Welding Committee and Machine Shop Practice Division. Atlantic City, N. J., Oct. 18–22.

AMERICAN SOCIETY FOR METALS. National Metal Congress and Exposition. Atlantic City, N. J., Oct. 18–22. W. H. EISENMAN, secretary, 7016 Euclid Ave., Cleveland.

AMERICAN WELDING SOCIETY. Annual meeting, Hotel Traymore, Atlantic City, N. J., Oct. 18–22. WARREN S. HAYS, managing director, 39 W. 39th St., New York.

ASSOCIATION OF IRON & STEEL ENGINEERS. Annual meeting combined with Iron & Steel Exposition, Stevens Hotel, Chicago. Sept. 28–Oct. 1.

CHICAGO EXPOSITION OF POWER AND MECHANICAL ENGINEERING. New International Amphitheatre, Chicago. October 4–9. CHARLES F. ROTH, vice-president, International Exposition Co., Grand Central Palace, New York.

MASTER BOILER MAKERS ASSOCIATION. Annual meeting, Hotel Sherman, Chicago. Sept. 29–30. A. F. STIGELMEIER, secretary, 29 Parkwood St., Albany, N. Y.

NATIONAL AUTOMOBILE SHOW. New York. Oct. 27-November 3.

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION Annual meeting. Chicago. Oct. 24–29. W. J. DONALD, managing director, 155 E. 44th St., New York.

NATIONAL MACHINE TOOL BUILDERS ASSOCIATION. Annual Convention. Hot Springs, Va., Oct. 25–27.

NATIONAL METAL SHOW. Convention Hall, Atlantic City, N. J., October 18-22.

NATIONAL SAFETY COUNCIL. Annual meeting. Kansas City, Mo. Oct. 11–15. W. H. CAMERON, secretary, 20 N. Wacker Drive, Chicago.

PORCELAIN ENAMEL INSTITUTE. Seventh annual meeting, Chicago, Ill. October 11–12.

PORCELAIN ENAMEL INSTITUTE. Second forum. Ohio State University, Columbus, Ohio. October 13–15.

SOCIETY OF AUTOMOTIVE ENGINEERS. National aircraft production meeting. Los Angeles, Cal., Oct. 7–9.

SOCIETY OF AUTOMOTIVE ENGINEERS. Fuels and Lubricants Meeting. Tulsa, Okla., Sept. 30-Oct. 1.

THE WIRE ASSOCIATION. Annual meeting held in conjunction with National Metal Show. Hotel Ambassador, Atlantic City, N. J. October 18-22. RICHARD E. BROWN, secretary, 17 East 42nd St., New York, N. Y.

PATENTS

August 31, 1937

Metal-Working Machinery

Welding Machine. James T. Catlett, Scotia, and Verni J. Chapman, Schenectady, N. Y., assigned to General Electric Co., New York. Patent 2,091,307.

Hydraulically Operated Machine Tool. Wallace H. Wood, Worcester, Mass., assigned to Norton Co., Worcester. Patent 2,091,425.

Cam Grinding Machine. Chester J. Rybick, Cleveland. Patent 2,091,456.

Grinding Machine. Norman B. Chace, Jr., Detroit, assigned to Ray Day Piston Corp., Detroit. Patent 2,091,469.

Power Hacksaw Grinding Machine. Walter De Long and Chris C. Andersen, Southgate, Calif., assigned to Velvet Power Hacksaw Grinding Machine Co., Southgate. Patent 2,091,501.

Centerless Grinding Machine. Arthur Scrivener, Birmingham, England. Patent 2,091,655.

Surface Broaching Machine. Francis J. Lapointe, Ann Arbor, Mich. Patent 2,091,736.

Metalworking Machine (Bending). John M. Christman, Detroit, assigned to Packard Motor Car Co., Detroit. Patent 2,091,749.

Sheet Straightening Machine. Friedrich K. Maußsnest, Woodside, N. Y., assigned to Hedwig Maußsnest, Woodside, N. Y. Patent 2,091,789.

Machine for Dimensioning and Sorting Machined Articles. Charles L. Hommel, Detroit, assigned to Bower Roller Bearing Co., Detroit. Patent 2,091,815.

Parts and Mechanisms

Welding Apparatus. James T. Catlett, Scotia, N. Y., assigned to General Electric Co., New York. Patent 2,091,308.

Gear Tooth Curve. Myron F. Hill, New York. Patent 2,091,317.

Thread Cleaning Nut. William T. Pease, Huntington Park, Calif., assigned to Snow Mfg. Co., Los Angeles. Patent 2,091,374.

Automatic Stop Mechanism for Grinding Machines or Lathes. Joseph Dyson Scaife, Cross Hills, near Kneighley, and John Lund, Cross Hills, England, assigned to John Lund, Ltd., Eastburn, England. Patent 2,091,527.

Spindle Bearing Lubrication. Frank L. Cone, Raymond H. Cone, Henry P. Chaplin, and Horace P. McClary, Windsor, Vt. Patent 2,091,700.

Current Interrupter for Electric Welding. Henry W. Roth, Montreal, Quebec, Can. Patent 2,091,719.

Operation Step Controller. Lawrence V. Whistler, Kenmore, N. Y. Patent 2,091,724.

Screw Thread. Edward J. McManus, Orange, N. J., assigned to Dardelet Threadlock Corp., New York. Patent 2,091,788.

Processes

Method of Cutting Gears. Ernest Wildhaber, Irondequoit, N. Y., assigned to Gleason Works, Rochester, N. Y. Patent 2,091,575.

Method and Apparatus for Forming Disks. Joseph E. Batie, Detroit, assigned to Kelsey-Hayes Wheel Co., Detroit. Patent 2,091,578.

Method of Treating Tungsten Carbide. Henry T. Baggett and Gorham W. Woods, Houston, Tex., assigned to Hughes Tool Co., Houston. Patent 2,091,903.

Tools and Accessories

Expansion Reamer. Adolph G. Carlson, Chicago. Patent 2,091,628.

September 7, 1937

Metal-Working Machinery

Press. Arthur A. Byerlein, Detroit, assigned to General Machinery Corp., Hamilton, Ohio. Patent 2,091,961.

Annealing Furnace. Lazenby C. Hamlink, Cleveland Heights, Ohio, assigned to The Gas Machinery Co., Cleveland, Ohio. Patent 2,091,979.

Power Press Tool or the Like. Harold Sinclair, Surbiton, and Andrew Fraser, Purley, England. Patent 2,092,092.

Boring Machine. Harry P. Wickersham, Huntington Park, and Erwin Burns, Los Angeles, assigned to Baash-Ross Tool Co., Los Angeles. Patent 2,092,101.

Automatic Internal Grinding Machine. Karl Jung, Berlin, Germany. Patent 2,092,215.

Automatic Grinding Machine. Harry Arter, Worcester, Mass., assigned to Arter Grinding Machine Co., Worcester. Patent 2,092,721.

Grinding Machine. Raymond A. Cole, Worcester, Mass., assigned to Norton Co., Worcester. Patent 2,092,727.

Cam Lapping Machine. Herbert S. Indge and George E. Hulbert, Westboro, Mass., assigned to Norton Co., Worcester. Patent 2,092,734.

Parts and Mechanisms

Heating Element for Annealing Furnaces. Lazenby C. Hamlick, Cleveland Heights, Ohio, assigned to The Gas Machinery Co., Cleveland, Ohio. Patent 2,091,980.

Alternating Current Welding Apparatus. Courtney N. Mitchell, Strongsville, Ohio. Patent 2,092,003.

Valve Facing Means. Ernest A. Hall, Toledo, Ohio, assigned to The Hall Mfg. Co., Toledo. Patent 2,092,117.

Automatic Machine Tool Control. Hans Shüz, Offenbach-on-the-Main, Germany. Patent 2,092,142.

Apparatus for and Method of Spraying Molten Metal. Purling A. Bleakley, Toledo, Ohio, assigned to The Gilford Corp., Toledo. Patent 2,092,150.

Power Transmission. Ernest J. Brasseur, Winnetka, Ill., assigned to A. B. Dick Co., Chicago. Patent 2,092,241.

Revolving Multiple Spindle Head. Lawrence Le Schauer, Wyoming, Ohio, assigned to The Cincinnati Bickford Tool Co., Cincinnati. Patent 2,092,336.

Machine Tool (Frame). Charles Alfred Olson, Madison, Wis., assigned to Gisholt Machine Co., Madison. Patent 2,092,587.

Transferring Location (For Hole Drilling). Harry M. Nielsen, Berkeley, Mich. Patent 2,092,653.

Wheel Driving Mechanism for Grinding Machines. Carl G. Flygare, Worcester, Mass., assigned to Norton Co., Worcester. Patent 2,092,714.

Grinding Wheel Truing Apparatus. Carl G. Flygare, Worcester, Mass., assigned to Norton Co., Worcester. Patent 2,092,730.

Crankpin Grinding Machine. Herbert J. Griffing, Worcester, Mass., assigned to Norton Co., Worcester. Patent 2,092,732.

Processes

Method of Making Welded Tube Joints. Kenneth V. Hart, South Bend, Ind. Patent 2,091,982.

Resistance Welding. Daniel Silverman, Brooklyn, N. Y., assigned to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Patent 2,092,093.

Anodic Cleaning Process. Ernest H. Lyons, Jr., Chicago, assigned to The Meaker Co., Chicago. Patent 2,092,130.

Tools and Accessories

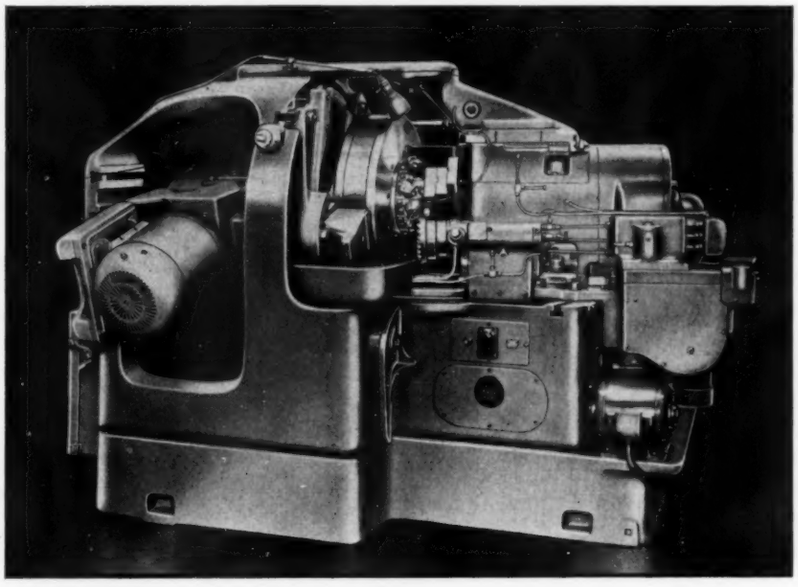
Hardess Testing Device. Frederick Knoop, Washington, D. C., assigned to The Government of the United States. Patent 2,091,995.

Wrench. Thomas A. Killman and Robert T. Killman, Nashville, Tenn., assigned to The Progressive Research Corp., Nashville, Tenn. Patent 2,092,516.

Boring and Milling Tool. Emil Gairing, Detroit, assigned to The Gairing Tool Co., Michigan. Patent 2,092,059.

Driver for Rotary Tools. Robert S. Blair, Stamford, Conn. Patent 2,092,598.

SHOP EQUIPMENT NEWS



Gleason No. 22 Single-Cycle Spiral-Bevel and Hypoid Gear Finishing Machine

Gears previously rough cut in the standard Gleason gear rougher can be transferred to the No. 22 single-cycle spiral-bevel and hypoid "Formate" gear finishing machine to be finished. The "Formate" method is claimed to be the fastest finishing method yet developed for finish cutting spiral-bevel and hypoid ring gears. The cutter and gear remain in normal full-depth operating position during the entire machine cycle of this unit, announced by Gleason Works, 1000 University Ave., Rochester, N. Y. In this machine, the cutter rotates at a uniform speed, and when the cutter revolutions equal the number of teeth in the gear, the gear is finished. Light finishing cuts are taken by each blade of the cutter and it is claimed that very accurate tooth spacing is obtainable with this "Formate" finishing process.

The accurate tooth spacing is claimed to be a result of the rigid construction of the entire machine, the light cuts taken by each blade, the hardened and ground dividing plate mounted directly on the work spindle, plus the fact that the same two blades finish each tooth space. Rigidity has been obtained by the use of an overhead tie, heavy sections of castings and by hydraulic clamping of the work-head. While the cut is taking place, the only movement is the rotation of the cutter spindle which is mounted on preloaded anti-friction bearings. All other bearing and guide surfaces of the machine are securely fastened.

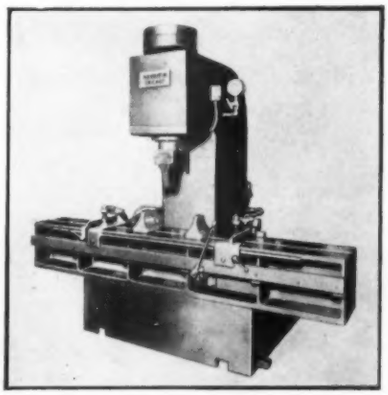
Chucking and dechucking operations are facilitated by power chucking and stripping mechanism built into the work spindle, and controlled by a conveniently located lever. The chucking arbor centers on the outside diameter of the work spindle for additional rigidity. The operator has only to move the control lever to withdraw the work head and dechuck the gear.

Automatic features have been protected by safety devices embodied in the design. Motors are mounted in the machine and are coupled direct. The automatic stop, which functions to stop the machine when the last tooth is cut, eliminates possibility of recutting. This stop resets itself after each gear. The machine will finish cut spiral-bevel and hypoid gears as large as 18 in. pitch diameter, 2½ diametrical pitch, 2½ in. face and 9 in. cone distance, having a ratio of 12 to 1. The largest pitch angle that the machine will cut is 85 deg. 14 min. while the smallest is 71 deg. 34 min. The index range is from 30 teeth to 78 teeth.

Hannifin 35-Ton Sensitive Straightening Press

A 35-ton sensitive hydraulic straightening press, especially designed for straightening operations on heavy crankshafts, has been announced by Hannifin Mfg. Co., 621 South Kolmar Ave., Chicago, Ill. This press has single-lever sensitive proportional control. When the control lever is moved in either direction the ram will move a proportional distance under full pressure and then stop. Operating valve automatically moves to neutral and the pump idles at zero pressure until another movement of the ram is required.

An individual hydraulic power unit is built into the base of the press, making a compact and self-contained installation. The table is



equipped with straightening fixtures, including an adjustable carriage which rolls on ball-bearing mountings on the hardened rails of the table. Supports on this carriage are hardened wheels provided with spring pads. Frame, base, reservoir and box-type table are welded.

Specifications: maximum capacity, 35 tons; stroke, 6 in.; ram speed down, 53 in. per min.; ram speed up, 77 in. per min.; distance from table to ram, ram up, 20 in.; distance from floor to table, 28 in.; distance from center of ram to face of frame, 9 in.; length of table, 90 in.; over-all height, 82 in.; base, 55½x61 in.; motor 10 hp.

Bethlehem Low-Alloy Steel

A low-alloy high-strength structural steel, Mayari R, has been announced by the Bethlehem Steel Co., Bethlehem, Pa. The steel is claimed to possess strength appreciably in excess of ordinary structural steel, good hot and cold working properties, good welding characteristics, little tendency to harden on rapid cooling, and great resistance to atmospheric corrosion.

To attain such a combination of properties the carbon content was held low and the increased strength brought about by elements other than carbon. Carbon content has therefore been fixed at approximately 0.10, and the desired strength and corrosion resistance are obtained by addition of nickel, chromium, manganese, silicon and copper.

It is claimed that the corrosion resistance of Mayari "R" steel is approximately two or three times that of copper-bearing steel or six times that of plain steel. These results are based on atmospheric exposure tests of several years duration made in industrial atmospheres at widely separated localities.

This steel cannot be formed and drawn as drastically as a dead soft steel, but otherwise no serious difficulties are encountered in fabrication. It can be worked in either a hot or cold condition.

It can be readily welded by any of the various processes, such as the electrical resistance method and by all of the fusion methods. However, like plain carbon steels, consideration should always be given to the preferred welding procedure which depends upon materials, designs, and the qualities desired in the welding joints for a particular service.

Under resistance welding the test results of spot welding, seam welding and flash butt welding were satisfactory. Compared to soft auto body sheets the shear tests were proportionately higher, while the single spot twisting test naturally was lower. Some of the important precautions in the welding of carbon steel also applied to Mayari R steel and include the following procedure control in fusion welding: first, when welding heavy sections preheating assists in reducing distortion; second, assemblies must be carefully planned to permit free movement of parts in shrinkage or welded sections; third, structures must be stress relieved after welding when fatigue or dynamic stresses are present.

The steel may be welded with mild-steel electrodes, and by adding reinforcements to the welds in cases where base metal strength is essential. A large number of high-strength electrodes are also available which produce weld metal with chemical analysis approaching that of the base metal or which deposits weld metal of high strength.

Chemical composition of this steel is: 0.08-0.20; manganese, 0.50-1.00; nickel, 0.25-0.75; copper, 0.50-0.70. Steel of this classification has a minimum yield point of 50,000 lb. per sq. in., and a minimum tensile strength of 65,000 lb. per sq. in., and a 16-gage plate has an elongation of 30 to 35 per cent in 2 in., when normalized at over 1,700 F. In all tests steel of any gage could be bent flat through 180 deg. Izod impact specimens from ½ in. plate withstood 81 to 87 ft.lb. in the normalized condition. Fatigue tests (R. R. Moore machine) indicate an endurance limit of about 49,000 lb. per sq. in. The steel showed little or no tendency to air harden even when cooled from 1,870 deg. F.

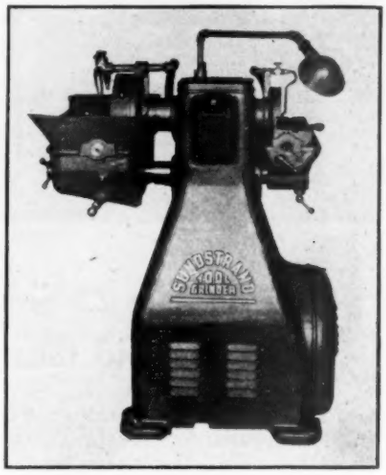
The accompanying table gives the results of tests on two heats of steel. No. 1 steel is particularly suitable for sheets, thin plates, and rivets. Heat No. 2 was designed for heavy plates, bars and structural members.

Physical Properties of Sample Plates From Mayari R Steel

	Thickness In.	*Direction of Rolling*	*Yield Point Lbs./ Sq. In.*	*Tensile Strength Lbs./ Sq. In.*	*Elongation in 8 In. Per Cent*	*Red. of Area Per Cent*	*Brinell*	*Bend*
Steel No. 1	3/16	L	57,600	71,900	28.0	66.3	137	Flat
	¼	L	52,350	68,600	30.0	61.4	131	Flat
Steel No. 2	3/16	L	63,000	81,900	20.0	62.9	163	Flat
	¼	L	66,200	81,900	28.0	64.7	156	Flat
	⅜	L	58,200	78,400	28.0	57.4	156	Flat
	⅜	L	54,900	78,400	25.5	60.6	152	Flat
	½	L	54,900	78,400	25.5	60.6	152	Flat
	¾	L	50,000	75,200	30.0	52.1	167	Flat

Sundstrand Tool Grinder

The Sundstrand Machine Tool Co., 2531 Eleventh St., Rockford, Ill., has replaced its 3-wheel tool grinder with a 2-wheel type designed to

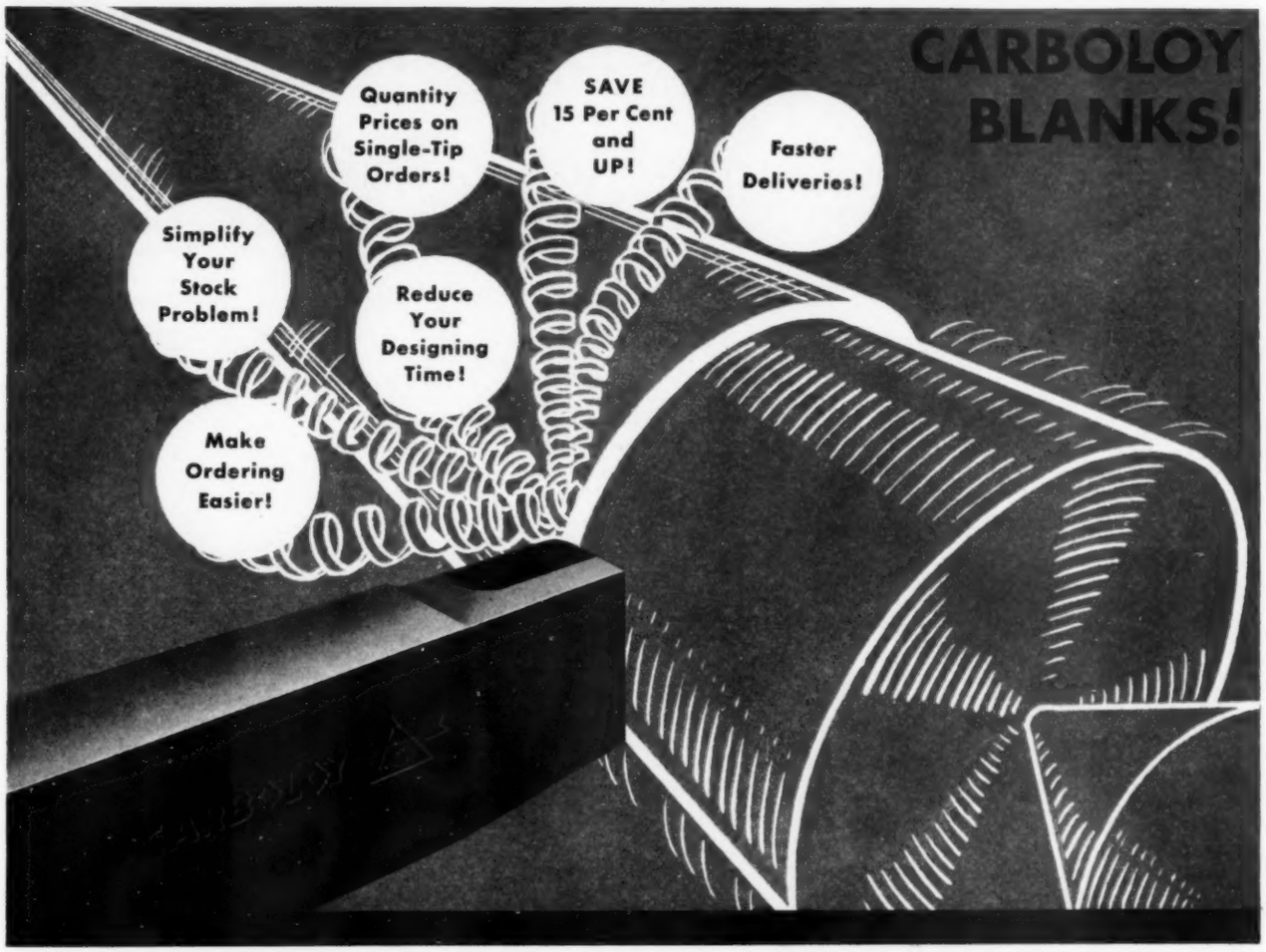


simplify the grinding of modern tools, including high-speed steel and cemented-carbide types. The machine uses a cup-shaped grain wheel for rough grinding. A screw-feed advances the tool against the wheel. A double nozzle is provided to flood either side of the grinding wheel with coolant as required.

A diamond-faced wheel is provided at the opposite end of the machine for finishing tools. Tool and protractor are moved back and forth as a unit in grooves in the stationary finishing table. Coolant is supplied to the center of this finishing wheel from where it is sent by centrifugal force to the edges of the wheel. The separate spindles of the grinding wheel are driven by V-belts driven by a 1½ hp., 1,800 or 1,500 h.p.m. motor placed in the base of the machine.

Specifications: dimensions of base,

Use the NEW, LOW-PRICED STANDARD



Get more extensive economies in your plant by adapting Carboloy STANDARD blanks for use on your Carboloy tools.

Only simple design changes, that in no way affect your tool performance, are necessary to take advantage of these LOWER-PRICED Standard Blanks. 152 sizes in 3 styles suitable for more than 90 per cent of all Carboloy tools in use today.

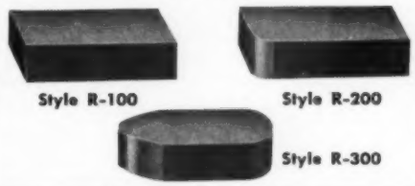
Get complete, cost-saving information. Send for Catalog M-37.

CARBOLOY COMPANY, INC.
DETROIT

Chicago Cleveland Newark Pittsburgh Philadelphia
Canadian Distributor: Canadian General Electric Co., Ltd., Toronto

CARBOLOY
REG. U. S. PAT. OFF.
CEMENTED CARBIDE TOOLS

The 3 Styles of Lower-Priced Standard Carboloy Blanks. Available in 152 sizes adaptable to more than 90 per cent of all Carboloy tools used.



Style R-100 Style R-200

Style R-300

Send for New 28-Page Catalog

CARBOLOY CO., INC.
2989 East Jefferson Avenue
Detroit, Michigan

Without obligation, send new 28-page catalog showing new standard Carboloy blanks at reduced prices.

Name_____ Title_____

Company_____

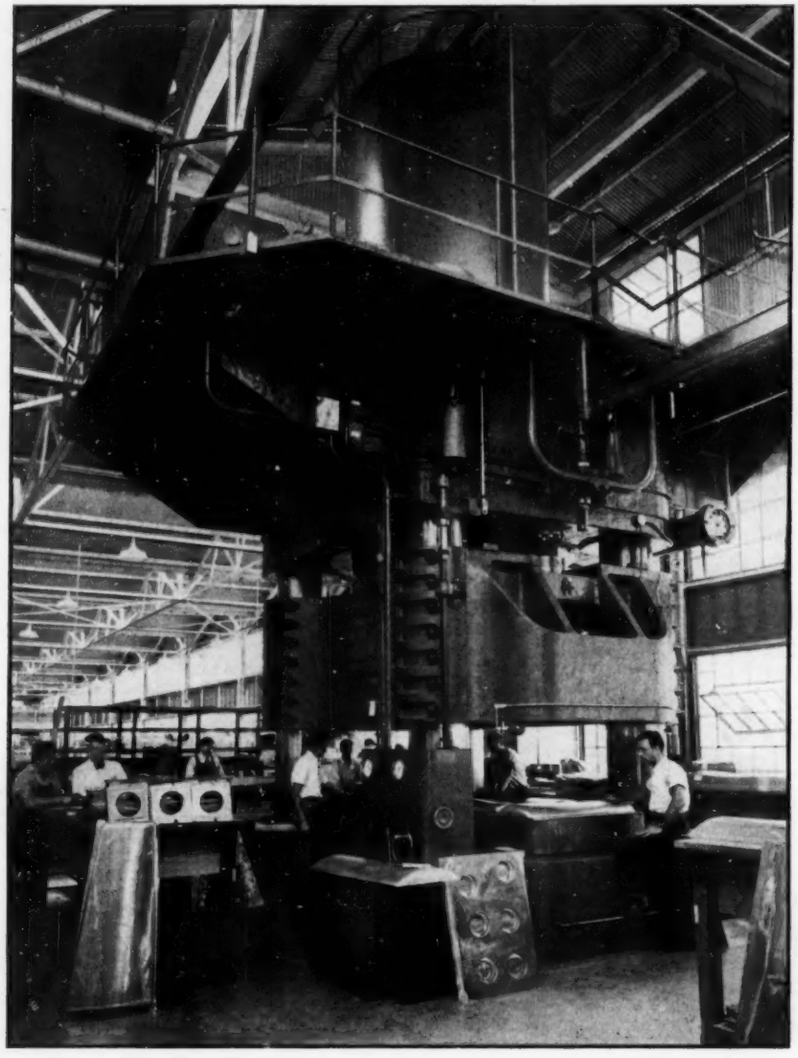
City_____ State_____

25x26½ in.; dimensions over all, 50 in. high, 41 in. wide, 37 in. deep; adjustment of work table, 10 deg. above horizontal, 30 deg. below horizontal; in-feed of grinding table, 2¾ in.; weight, including motor, 1090 lb.; height of spindle above floor, 40¼ in. Model "A" has a rough grinding wheel running at 950 r.p.m. and finishing wheel at 3,600 r.p.m. Model "B" has a rough grinding wheel running at 2,100 r.p.m., and finishing wheel at 3,600 r.p.m.

H.P.M. Self-Contained 5,000-Ton "Hydro-Power" Hydraulic Press

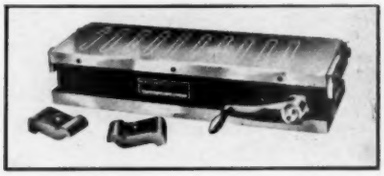
This 5,000-ton self-contained hydraulic press, operated by the "Fastraverse" hydro-power system and manufactured by The Hydraulic Press Mfg. Co., Mount Gilead, Ohio, has been installed in the plant of the Douglas Aircraft Co., Inc., Santa Monica, Calif. It is being used to shape and form parts for Douglas commercial transports. Nine twelve-wheel flat cars were required to ship this press.

The complete press weighs 840,000 lb. and maximum opening between platen and bed is approximately 4 ft. Total pressing force of 10,000 lb. is created by a single 6-ft. diameter hydraulic ram. Four H.P.M. radial pumps of the variable-reversible-delivery type, direct-driven by two 150 hp. electric motors, furnish oil under a pressure of 2,500 lb. per sq. in. for operation of the press. Hydraulic power from these pumps is directly applied, without intervening valves, to the press ram. Speed and direction of press movements are controlled by regulation of the volume and direction of pump output from the control position.



B.&S. Magnetic Chucks

A magnetic chuck of the permanent magnet type is offered by Brown & Sharpe Mfg. Co., Providence, R. I., for sale only in the United States. No electrical connections, wires,



switches and auxiliary generators are required. Permanent magnets used are of special alloy and are claimed to maintain several times more energy than permanent magnets previously available. Both the ends and back are provided with removable stop plates which may be adjusted vertically to suit the requirements of different jobs. Moving parts are equipped with greaseless bearings to minimize wear.

These chucks are claimed to be well adapted for wet grinding as they are completely sealed so that coolant cannot enter the internal parts. They are readily portable and may be used on a bench for holding small thin pieces, or large pieces for polishing and similar jobs, and may be used for inspection and testing purposes by toolmakers and inspectors.

Model 510 has a working surface of 5⅝ by 10⅜ in.; magnetic surface, 3⅞ by 7½ in.; height, 3⅜ in.; length over-all, 12$\frac{3}{32}$ in.; shipping weight, 50 lb. Model 618 has a working surface of 6⅜ in. by 18⅛ in.; magnetic surface, 4½ x 14$\frac{1}{16}$ in.; height of chuck, 3⅝ in.; length over-all, 21 in.; shipping weight 104 lb.

Oxweld Type CM-13 Pipe Cutting and Beveling Machine

The Oxweld Type CM-13 pipe cutting machine has been designed by The Linde Air Products Co., 205 E. 42nd St., New York, for pipe cutting and beveling operations in the industrial field, for quickly and economically preparing pipe for welding. The machine requires only one man for its operation. Severed sections of pipe fall free at the finish of a cut. Channel ring and blowpipe rotate around the entire circumference of the pipe in one cut. It is actuated during the cutting operation by inclosed gears which can be released by means of a friction clutch for hand rota-

Photograph courtesy Whitin Machine Works

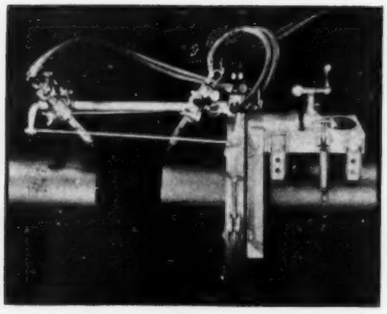
Here, a BAY STATE H9 bond, vitrified grinding wheel and BAY STATE rubber regulating wheel are grinding and finishing spindles to an extremely close tolerance on a production basis. Exacting conditions of this type demand grinding wheels that are scientifically correct in **every** respect.

1. **LONGER WHEEL LIFE**
2. **INCREASED PRODUCTION**
3. **WORK HELD TO SIZE**
4. **LESS REJECTIONS**

Four reasons for BAY STATE'S success in wheels for centerless grinding.

BAY STATE

ABRASIVE PRODUCTS COMPANY
WESTBORO MASSACHUSETTS



tion of the channel ring. Located on the ring is a detachable valve body which serves as a connection between the sources of oxygen and acetylene and the machine itself. An additional blowpipe may be placed on the tube extension arm making the machine adaptable for double cutting and beveling. It is available in one size which is adjustable for cutting or beveling 8 to 12 in. diameter pipe.

Newton Unit-Head Milling Machine

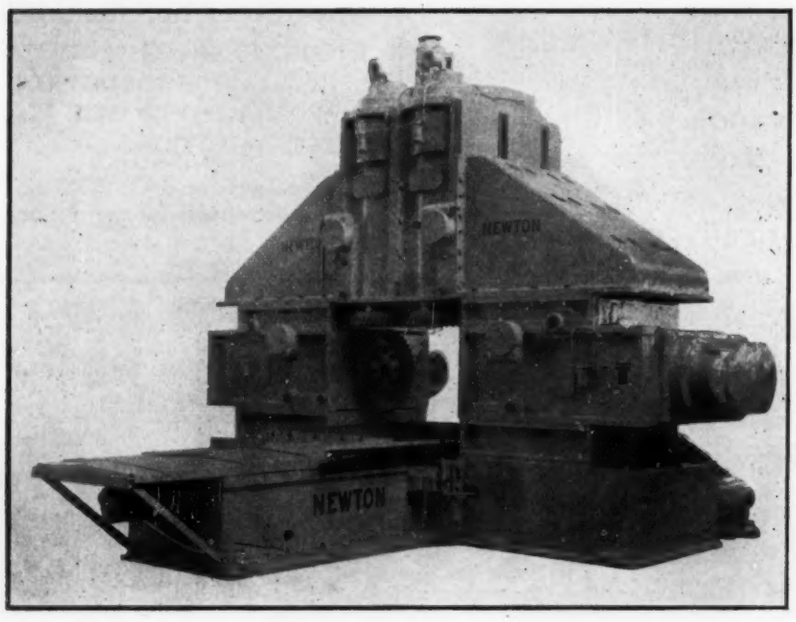
A line of Newton manufacturing-type milling machines, which permit the rearrangement of a single-purpose machine to suit changes in the product, has been developed by Consolidated Machine Tool Corp., Rochester, N. Y. These machines are designated as unit-head, box-type milling machines and are made up of several individual milling units on a planer-type milling machine base.

The machine illustrated is made up of two horizontal head units, two vertical units plus an auxiliary vertical spindle for cleaning out the cut between the two larger vertical cutters. Should this machine be required for work necessitating four horizontal spindles, the machine can be arranged by transposing the independently-driven vertical heads and substituting a fill-in piece at the top.

Unit heads can be reset for use in any position, horizontal, vertical or at any angle. The box-type construction permits rearrangement of blocks and unit heads to accomplish any particular milling job.

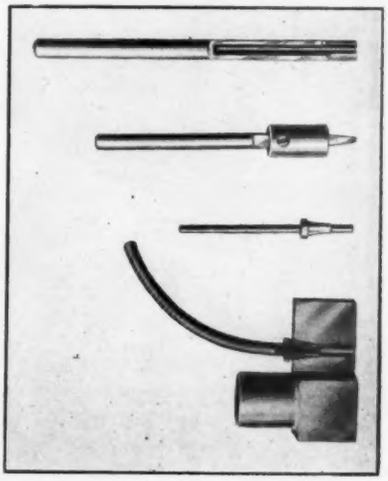
Each head has its own motor mounted directly on the assembly. This motor is direct-gear connected by silent pinion through suitable reduction gears, including pick-off gears which can be transposed or changed for varying cutting speeds. Machines can be furnished with quick change gears and also with d.c. adjustable-speed motor drive. Each spindle has separate end-adjustment and provision for locking the spindle quill. All heads are drilled with closely placed bolt holes to allow for setting up.

Table is of planer-type construction with self-aligning V-shaped ways. It has a planed top surface and is provided with parallel T-slots. Pressure lubrication is provided. Feed drive to table is by hydraulic pressure and is controlled by a single lever at the operating position. This hand-control of feed and rapid traverse is supplementary to automatic control regulated by adjustable trip dogs at the side of the table. Machines may be provided with hydraulic-screw or cylinder feed or with mechanical screw feed.



Bijur Drive Bushing Connection

A drive bushing connection, devised by the Bijur Lubricating Corp., 22-08 43rd Ave., Long Island City, N. Y., provides efficient tubing connection on lubrication feed lines to bearings where space is limited and there is insufficient room for any type of threaded nut or conventional bushing. The small tapered brass bushing employed has a center hole to slide readily over the particular size of tubing used. This bushing is mounted into a shallow hole which is taper reamed. In the assembly operation, the drive bushing is placed into the mounting hole and the tube inserted as far as possible. Then, by means of a



simple drive tool, one or two blows with a hammer will drive the bushing home. The taper fit causes the bushing to grip the tubing tightly and make an oil-tight and dirt-proof joint. The bushing is designed to be used with standard types of Bijur equipment. Minimum size of tubing which can be connected is $\frac{3}{32}$ in.

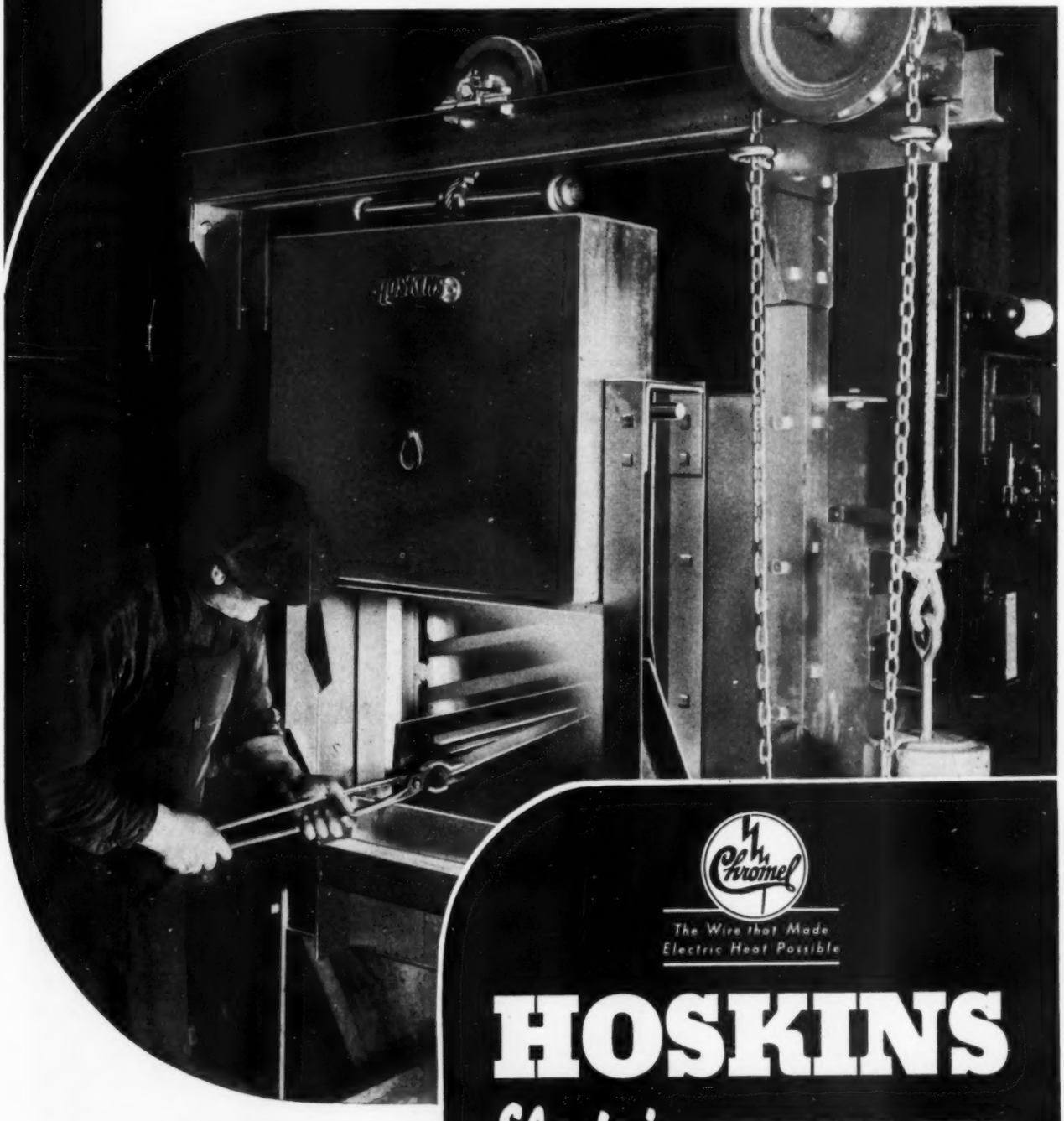
Oxweld Type C-35 Blowpipe

The Oxweld Type C-35 machine cutting blowpipe has been announced by the Linde Air Products Co., 205 E. 42nd St., New York, for machines which require a blowpipe not longer than $10\frac{1}{2}$ in.

A combination injector is employed in this blowpipe making it possible to use it with either a low-pressure or medium-pressure acetylene source. Three hose inlets are provided in order to take advantage of the latest developments in blowpipe cutting operations which require a separate hose, regulator and

WILL IT HOLD?

A leading fabricator of metal uses this Hoskins Electric Furnace for "stress heating, for test purposes, of metal that has been welded"—that is, to determine the strength of the weld. Speaking of the furnace, the user says he likes "its automatic control and evenness of heat." . . . The conditions of any test should, of course, permit of exact duplication. That's the fundamental reason why this particular Hoskins Furnace was bought. This exact control of heat conditions is also of value to you in your heat-treating operations. You can do, with electric heat, things that can be done in no other way. So, find out more about Hoskins Electric Furnaces, by asking us for our *new* Catalog—56T. . . . Hoskins Mfg. Co., Detroit, Mich.

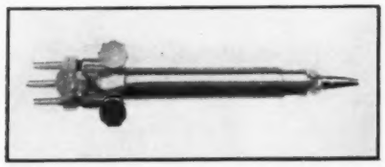


Chromel

The Wire that Made Electric Heat Possible

HOSKINS

Electric **FURNACES**



oxygen supply for both the preheat and the cutting oxygen. Blowpipe can also be used with only two hoses and regulators. In this case the two oxygen inlets on the blowpipe valve body are connected by means of a two-way oxygen inlet adaptor.

M.S.A. Salt Dispenser

The salt tablet dispenser manufactured by Mine Safety Appliances Co., Braddock, Thomas & Meade Sts., Pittsburgh, Pa., is made of molded bakelite with chromium-finished metal parts. The dispenser will hold 250 tablets and is arranged to dispense one tablet at a time. Brackets have been provided for wall mounting. Its waterproof construction makes it satisfactory for outdoor as well as indoor use.

M. & W. Dielectric Black Enamel

A black enamel, claimed to be especially suitable for finishing electrical apparatus, such as steel switchboards and instrument panels, has been developed by Maas & Waldstein Co., 438 Riverside Ave., Newark, N. J. This dielectric enamel dries to a rubber finish and is claimed to be tough, durable and to have high electrical resistance. It is applied by spraying and a switchboard panel that has been marred or defaced can be easily refinished by spraying on another coat of enamel. A surfacer, having similar dielectric properties, is furnished for preparing the surface to be finished with this enamel.

"Rayflex" Fatigue Testing Machine

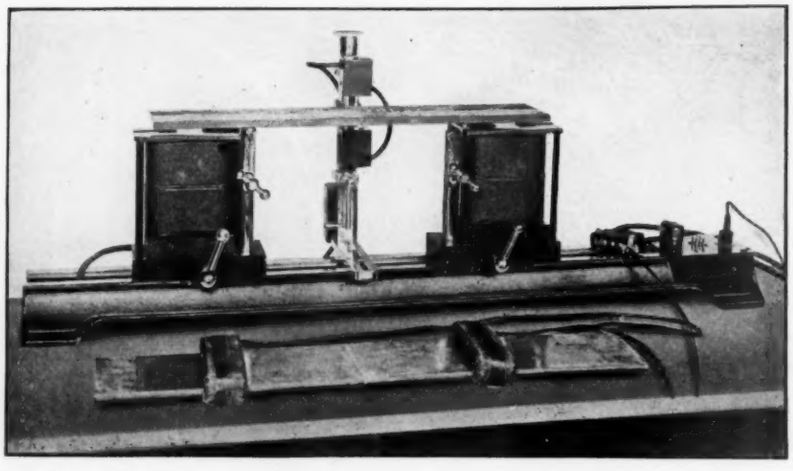
The "Rayflex" fatigue testing machine, developed by the Raytheon Mfg. Co., 190 Willow St., Waltham, Mass., enables tests to be made on full sized parts, or at least parts sufficiently large to represent metal, method of preparation and surface condition used in actual service. The specimen may range from $\frac{1}{4}$ in. to 1 in. in diameter or thickness and from 1 to 3 ft. in length. The width of flat stock may be as much as 5 in.

The specimen is vibrated at its own natural period, being supported and held at the nodes by electromagnets. These are actuated by an oscillator-amplifier combination. The frequency of the machine can be varied from 6,000 to 18,000 cycles per min., depending on the dimensions of the specimen and the amount of energy it absorbs. A cycle counter is incorporated in the control cabinet which indicates the total number of cycles of operation. An automatic timer is provided to check the frequency.

An automatic control is provided to maintain constant amplitude. After fatigue has begun in the specimen, the natural period increases and this automatically shuts the machine off. The cycle indicator then shows the total number of reversible stresses which the specimen took.

Magnaflux equipment is included with the fatigue tester and is used to locate failure in the specimen. Non-magnetic materials may be tested by fastening iron sleeves to the end of the specimen.

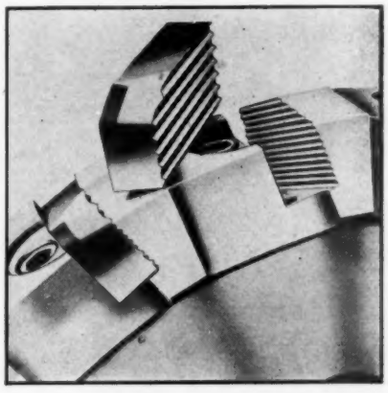
The stress applied to a specimen of uniform section and the Young's modulus of the specimen can readily be obtained from a knowledge of the maximum deflection at the center of the specimen and its dimensions. The maximum deflection or amplitude may be read on a meter mounted on the control panel. The machine is suited for testing welded sections and non-uniform sections. Instruments are standard equipment and may be purchased in any supply house.

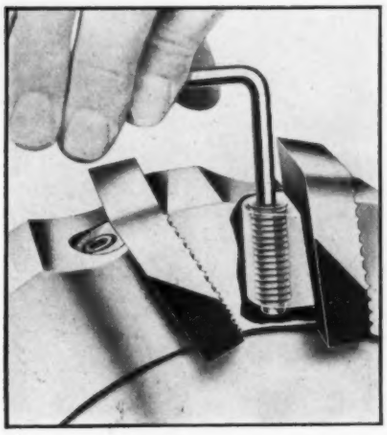


McCrosky "Tru-Ground" Serrated Blades

A serrated blade with serrations ground from the solid has been announced by McCrosky Tool Corp., Meadville, Pa., for use in inserted blade tools. Heretofore serrations by grinding have been difficult and expensive and not practical for use on high-speed steel blades. The "Tru-Ground" form of serration avoids the sharp V form of grinding wheel necessary to produce the sharp V form of groove between two adjacent teeth in conventional serrations. This has been accomplished by omitting every alternate tooth, the resulting pattern having a flat-bottomed groove between the teeth which eliminates the sharp V ridge on the periphery of the grinding wheel.

Omitting every other tooth in the



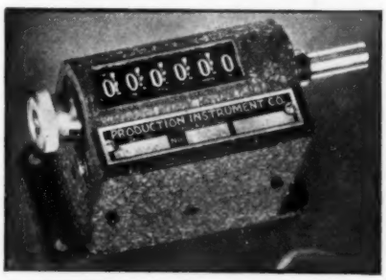


blade does not change the adjusting increments of the assembled tool as no teeth are omitted from the blade slot.

This method permits grinding high-speed steel blades from the solid after hardening. It is also applicable to Stellite blades and to blades tipped with tungsten carbide. Blades with the Tru-Ground serrations will be used exclusively in McCrosky Jack-Lock milling cutters.

"Production" Type MC-3-W Mechanical Counters

The Type MC-3-W mechanical counters, announced by Production Instrument Co., 1325 South Wabash Ave., Chicago, Ill., have six large legible number wheels, and are arranged for shaft drive. Count advances one number for each turn of the shaft and generally subtracts for each reverse revolution of the shaft. The re-set knob returns all number wheels to zero with one revolution of the re-set. This heavy-duty mechanical counter has a frame and case of die-cast design with provision for convenient mounting. Positive and accurate operation is claimed for the drive action, which is designed to prevent skip or coasting. Specifications: length $3\frac{5}{8}$ in.; height, $2\frac{5}{8}$ in.; width, $1\frac{3}{4}$ in.; diameter of mounting holes, $\frac{3}{16}$ in.

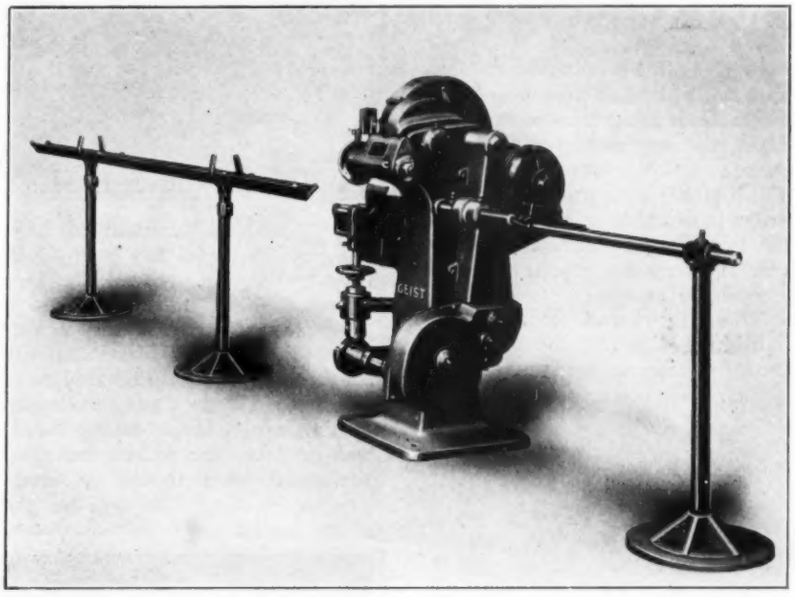


Geist Semi-Automatic Roller Pipe Cutter

Improvements in design of the Geist roller pipe cutter, announced by Landis Machine Co., Waynesboro, Pa., include operation of the rollers by cam action. Both the hand lever and the pedal have been eliminated and movement of the rollers in a vertical plane is actuated by a gear-driven disk cam. Separate cams are necessary for standard wall and extra-heavy pipe. The operator is relieved of all work except the feeding of pipe into the machine.

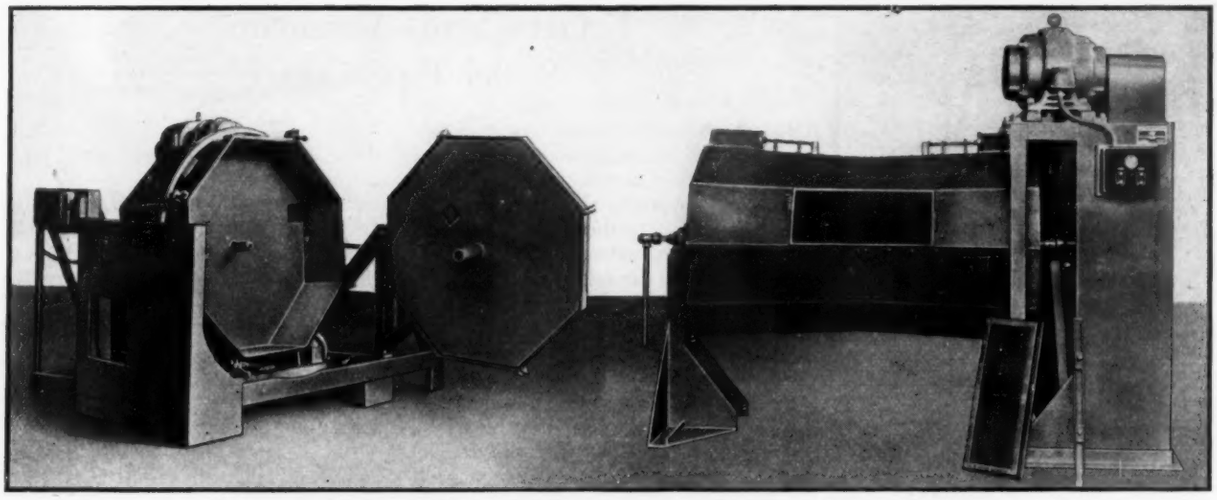
Operating cycle is controlled through pick-off gears and the gear train is arranged so that by reversing one pair of gears, or employing an extra pair, four different speeds are available. Speeds are fixed so that it is possible to cut off from 10 to 35 nipples per min., depending upon the pipe diameter.

This machine is equipped with anti-friction bearings, and a high-pressure greasing system is used to insure positive lubrication. Another lubricator, built into the machine, lubricates and cleans the cutter disk. Pipe support has been redesigned to eliminate gripping of the pipe while under cut. The new support is in the form of a trough, 10-ft. long, lined with a series of metal strips so placed as to minimize friction between the pipe and the trough. Arms extending above the trough eliminate the possibility of the pipe falling out during the cutting operation.



B. & D. Nos. 32 and 42 Nut Runners

Both the Nos. 32 and 42 nut runners manufactured by Black & Decker Mfg. Co., Towson, Md., have been designed for hard driving on production operations. These electric tools are suitable for driving wood screws, lag screws and running up nuts and bolts on all types of assemblies. The No. 32 unit has capacity for nuts and bolts up to $\frac{1}{2}$-in. diameter, and the No. 42 nut runner is designed for marine and railway construction work. Other models handle nuts and screws of every type from the smallest sizes used in electrical instrument assembly to large $\frac{7}{8}$-in. nuts and bolts.



Left—Ransohoff machine has 48-in. drum, is used for burnishing cash register drawers. Right—36-in. drum is designed for burnishing tightly packed parts

Ransohoff Burnishing Barrels

N. Ransohoff, Inc., Cincinnati, Ohio, has adapted one of its standard ball-return burnishing barrels for burnishing the insides of cast-aluminum change drawers for cash registers. The barrel is equipped with a 48-in. drum into which a fixture is fitted for holding the drawers rigidly in place, spaced at regular intervals around the periphery.

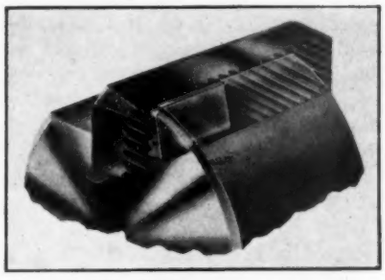
When the barrel is run in the burnishing direction, the balls enter the burnishing section from the ball-storage compartment. After running the proper length of time, the ball-return passage is closed, the drum is reversed and all opposite surfaces of the pockets and drawers are burnished. Upon completion of this operation, the ball-return passage is opened and the balls automatically return to the storage compartment. The balls and work are rinsed by water from lines in the hollow shaft and swivel joint.

Another type of barrel was designed by this company for cleaning skate parts. In this machine the burnishing compartment is the middle of three sections of the drum, the other two sections being storage compartments for the burnishing balls. Parts are loaded in the middle section tightly so that they have no chance to tumble on one another. The method of burnishing and cleaning work is the same as that described above.

Ball compartments at each end of the barrel are 36 in. in diameter by 14 in. in length. Burnishing compartment in the center is 36 in. in diameter by 36 in. in length, and has a capacity of 16 cu. ft., or possibly 1,500 lb. About 3,000 lb. of burnishing balls are used.

Gair-Lock Cutter Blades

The "Gair-Lock" method of locking inserted blades has been developed by the Gairing Tool Co., Inc., Detroit, Mich. It is intended to give a wide range and easy adjustment for inserted blades in milling cutter heads, and may be applied to all multiple-blade cutting tools, including boring bars, boring heads and reamers. The locking member, positioned in a shouldered recess adjacent to the blade slot, fits the



"Gair-Lock" milling cutter blade locked in position in cutter head

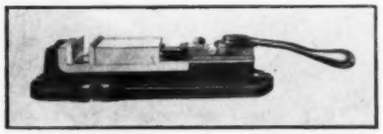
serrated blade and locks it. Blade and lock are inserted lengthwise.

Adjustment is simplified as there are no wedges to drift out or upset. A tap on the rear of the blade releases it instantly and it can set out the required distance. Single blades may be removed and replaced without lifting or removing any other blades in the cutter head. It is claimed that the method of construction gives good rigidity and that the blades may be set at the correct angle and rake.

The design is intended to prevent blade shifting or tilting, to permit more blades per diameter and closer tooth spacing, to eliminate special bodies for tungsten carbide blades, to prevent chip interference at face of blades, and to allow interchangeability of blades. No auxiliary pins, screws, collars or wrenches are required to position the blade.

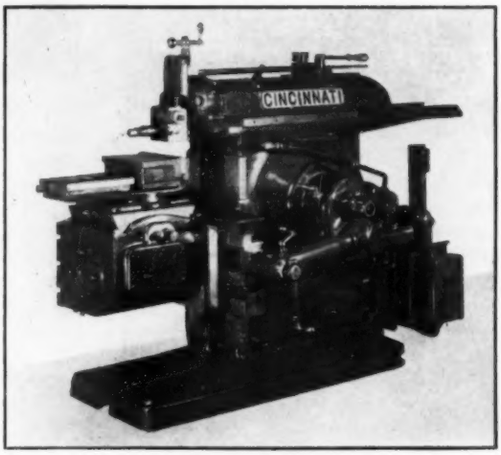
B.&S. Cam Vise

The No. 2 C cam vise is intended by Brown & Sharpe Mfg. Co., Providence, R. I., for machining duplicate parts. A lever and cam actuate the



movable jaw, and the large screw and nut give approximate adjustment for the piece being machined. Removable jaw is gibbed to the slide by straps which are protected from chips and dirt. Parts subject to wear are hardened and ground and the jaws are interchangeable. Tongue slots, at right angles, permit vise to be set either lengthwise or at right angles to tables, and will fit either 11/16 in. or 13/16 in. slots. Specifications: width of jaw, 5⅛ in.; depth of jaw, 1¼ in.; jaw opening, 2 in.

Cincinnati High-Speed Shaper



The Cincinnati Shaper Co., Cincinnati, Ohio, has added a high-speed shaper to its line of rapid traverse, universal and utility shapers. The rocker arm and link are of aluminum alloy to reduce the weight of the reciprocating parts and to insure smooth reversal at 200 strokes per min. The ways for the sliding block are cast iron. Head of the shaper is equipped with a clapper retainer that can be made inoperative at will. This device restricts the upward swing of the clapper and insures its proper operation.

The head can also be equipped with a tool lifter. This is particularly desirable with cemented-tungsten-carbide tools to protect their cutting edges. The ram is of Meehanite which is claimed to reduce the weight and increase the strength and accuracy, and at the same time provide an excellent bearing in the cast iron bearing of the column.

The machine has a 16 in. capacity with 200 strokes a minute. Net weight is 4,500 lb.

Airco No. 1 Welding Rod

The Airco No. 1 high-ductility, alloy-steel rod has been developed by Air Reduction Sales Co., Lincoln Bldg., New York, N. Y., to withstand considerable heat without bend ductilities of single-layer welds of 20 to 30 per cent; free bend ductilities of multi-layer welds, up to 40 per cent on low and medium carbon steels; ultimate tensile strength, 60,000 lb. per sq. in. minimum; Rockwell hardness of weld metal from B60 to B85, depending on carbon content of base metal and type of weld; Charpy impact values of 15 to 30 ft. lb.

Shaw Model "M 42" Blue-Printer

The Shaw Model "M" printer has been designed and built by the Shaw Blue Print Machine, Inc., 9-11 Campbell St., Newark, N. J., with a printing speed range from 9 in. to 12 ft. per min. Only three arc lamps using ½x9 in. carbon are used. These lamps have pyrex globes. Lamps are designed so that the arcs will burn steadily for 45 min. before breaking and require trimming only every 8 hr. of continuous burning.

A ¼-hp., constant-speed motor with a Reeves variable-speed drive and control furnish the power. Individual switches for each lamp, motor and fan, as well as a start and stop switch are provided. Speed control with a speed indicator is conveniently placed at the right-hand side.

Contact glass is curved to 11 in. radius by 48 in. long which provide sufficient space for 42 in. width tracings. Feeding table is 18 in. wide. Treadle at the front of the machine releases tension on the endless canvass band so that the tracing may be withdrawn. Oilite bearings are used on all shaft and bearing points.

The machine operates on 220 volts, d.c. or a.c. The 42 in. machine is 65 in. wide, 41½ in. deep, 67 in. high and weighs approximately 650 lb. Provision may be made for adding washing and drying units. A 54-in. machine can be built on special order.

"Production" Oil-Pump Countershaft Drive

Operation of an auxiliary oil pump is possible by a standard idler-pulley unit designed for use in connection with the Type 844 motorized countershaft offered by The Production Equipment Co., 5219 Chester Ave., Cleveland, Ohio. An arm carrying two ball-bearing-mounted idler pulleys is attached to the vertical support column of the motorized countershaft. Both the arm and the idler

pulleys are adjustable as to location to suit a wide range of conditions. The countershaft pump-drive pulley is mounted on the drive shaft adjacent to the cone pulley, and both the idler pulleys and the pump are lined up to provide a direct drive between the countershaft pulley and the pump. The adjustable idler pulleys allow for belt stretch and it is claimed that the drive requires little supervision after it is installed. The installation shown consists of a Type 844 unit on a screw machine.

Cimatool "Bolender" Gear Burnisher

The Bolender burnishing machine for truing the surfaces of gear teeth has been improved by the Cimatool Co., Dayton, Ohio. The slide which carries two idle burnishers has been increased in size and made

more sturdy, and is fitted with a screw adjustment for rapid positioning. The upper bearing support for each of the two idler burnishers and the master burnisher is mounted in a swing arm which permits easy access in change-over from one job to another. Work arbor has a rapid and fine adjustment for vertically positioning the gear to be burnished and its lateral adjustment is easily accomplished.

Dial pressure gage shows the actual pressure between burnisher and

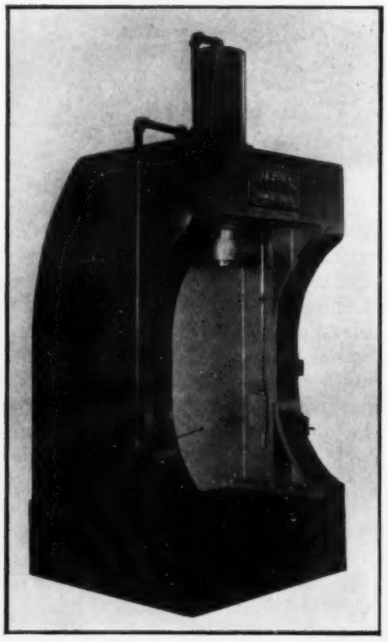
Easily removable cover of Cimatool Gear Burnisher prevents coolant from splashing, allows easy inspection and removal of work

the work gear. Four louvred doors provide cooling for motors, pumps and piping, all of which are totally inclosed and protected within the base of the machine. The built-in coolant reservoir is easily accessible and may be cleaned out by removing one of the snap-on doors.

The cover provides adequate space for loading and unloading the machine and at the same time prevents the coolant from splashing out. A sight gage gives level and flow of lubricant in the drive compartment. Machine has capacity of gears from $1\frac{1}{8}$ to 20 in. in diameter.

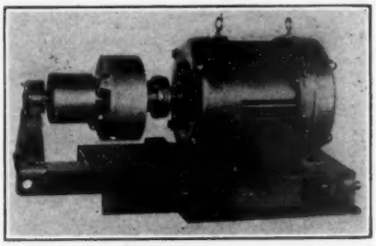
Colonial Hydraulic Assembling Press

Designed for automotive assembly work, this 50-ton, down-acting hydraulic press is offered by Colonial Broach Co., Detroit, Mich. Each press is a self-contained unit of welded-steel construction. Stroke is 18 in. and operating pressure is furnished by a 1,000 lb. pressure pump. Platen is 36-in. square, providing clearance for handling large assembly work.



"Production" Eight-Speed Motor-Drive Unit

A special drive, consisting of a four-speed motor and an auxiliary gear reduction unit, is offered by The Production Equipment Co., 5219 Windsor Ave., Cleveland, Ohio. This unit is normally used on single-pulley drive applications, and the driving pulley, mounted on the extended shaft to the left of the gear unit, is designed to operate at either the motor speed or the gear reduction speed. When the pulley runs at the motor speed, the gear unit revolves, but when the gear reduction is operating, the gear case is held stationary. The mechanism for holding the gear case consists of a device by which the gear case can be locked or released at the desire of the operator.



These drives can be furnished with two, three or four speed motors in either constant-horsepower or constant-torque design. The gear case is machined and balanced for operation at the desired motor speeds. These units are available in ratings up to 5 hp., with speed ranges up to and including 24 to 1.

Chicago Soft-Rubber Polishing Wheels

Soft-rubber polishing wheels, announced by Chicago Wheel & Mfg. Co., 1101-1103 West Monroe St., Chicago, Ill., made of a soft-rubber bonded abrasive material, are intended for use where hard felt, leather, wood or hard canvas wheels have been used, or for jobs where difficult shapes to polish have made such types of wheels satisfactory to use. Made like an ordinary grinding wheel, these wheels are impregnated with abrasive grain of any required type. Labor involved in re-coating polishing wheels is eliminated. There

is nothing to be added to the surface of the wheel.

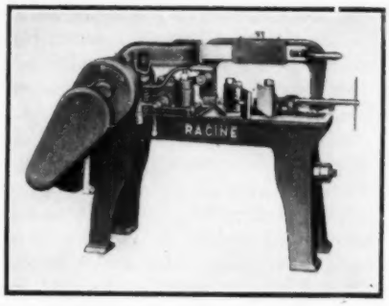
These soft-rubber polishing wheels are available in the conventional type of wheel, also in sticks, sheets, blocks and in mounted-wheel types mounted on a steel mandrel. There are a wide variety of combinations of grain and bond ranging from a soft and fairly flexible product to a hard, dense type nearly like a grinding wheel in grade and appearance. It is claimed that greatest efficiency is obtained when the wheels are kept at 4,000 surface ft. per min. or below. These wheels can be trued and dressed with ordinary vitrified dressing sticks or diamonds. Contour of the face is held over long periods of time with little attention. Extreme pressure in polishing is not necessary; only enough pressure to hold the work to the wheel is needed. High pressure retards the cutting action of the grain, causes undue heat and high wheel wear.

"Super Speed" Punch Press

The Super Speed punch press, manufactured by Super Speed Press Corp., 55 Liberty St., New York, operates at a speed of 1,000 strokes per min., and will produce 1,000 blanks per min. with a single blank die. This speed is accomplished by the principle involved, being an oscillating die synchronized with a continuous feeder. This movement allows the material to contact the die at the full speed of the press. The machine is designed to do blanking, piercing, progressive work and shallow forming. Special dies are not needed and the press can be changed from one job to another in approximately twenty minutes.

The continuous feeding device never allows the stock to stop by synchronizing the feeder with the speed of the oscillating die. Speed of the feed rolls is adjusted by turning a handwheel on the variable-speed control which may be done while the press is in operation. An adjustable crankshaft is provided which allows adjustment for various sized blanks.

Construction of the machine is sturdy, and it is claimed that there is no vibration of the press, no friction on the dies.



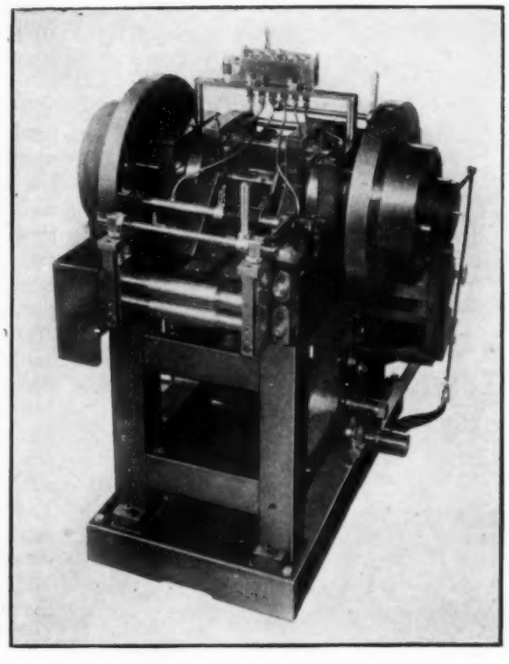
Racine Dry-Cut Power Saw

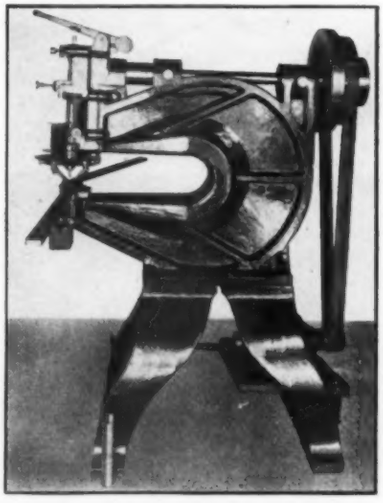
The power saw manufactured by Racine Tool & Machine Co., Racine, Wis., is of the dry-cut type and employs a simple hydraulic feed principle. Capacity of saw is 6x6 in. Vise swivels to 45 deg. A V-belt drive from motor to drive gears is used, and two speeds are available. Feed dial gives infinite range of pressures from zero to maximum to accommodate all classes of materials.

The hydraulic feed system consists of a plunger pump operated by a cam. Hydraulic pressure is applied to top of feed cylinder through a valve with a numbered dial for varying the pressure. Entire hydraulic system is self-contained.

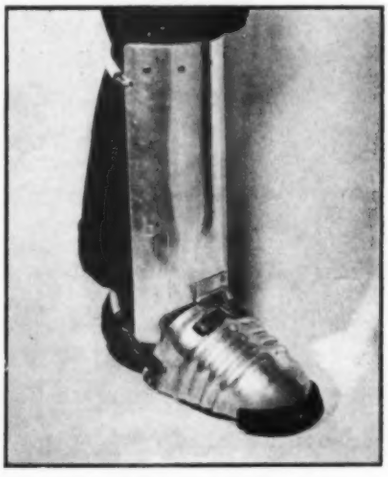
Gray No. 4-A Turret-Head Metal Nibbler

Model No. 4-A turret head metal cutter or nibbler, manufactured by The Gray Machine Co., Box 596, Philadelphia, Pa., has a $\frac{3}{8}$-in. capacity with a 24-in. throat. The machine has table support arms for supporting stock in any position. It is provided with an interchangeable eccentric, by which it is possible to accommodate a shearing attachment to shear stock up to and including





$\frac{1}{8}$-in. in thickness, Machine cuts 25 to 40 in. per min. A 3-hp., 1,750 r.p.m. motor and a 4-in. pulley are required. A two-speed cone flywheel pulley furnishes speeds of 450 and 900 r.p.m. Machine width, 30 in.; height, 60 in.; length, 68 in.



Sankey Shin Guard

An aluminum-alloy shin guard made by the Ellwood Safety Appliances Co., 201 Fountain Ave., Ellwood City, Pa., may be attached to the Sankey "Improved" foot guard. The complete unit for foot protection is easily put on without special adjustment and permits free foot and leg action when in use.

Capital Goods and American Progress

The American standard of living is determined by the kinds, quality and quantity of goods used and services enjoyed by the people of the nation—by the food they eat, the clothes they wear, the labor-saving conveniences they enjoy and the facilities available for the leisure time activities they desire.

Back of the goods and services which determine the standard of living are the capital goods industries of the country. These industries furnish the facilities for production, distribution, transportation, communication and commerce which make available, when and where they are needed, the essentials to the current standard of living. They also make possible the new products and services to which the country must look for a rising standard of living. Several million workers are required to construct, maintain and expand this capital equipment to keep abreast of the country's economic and social needs. Business transactions in connection with these activities account for a large part of all the commercial transactions in the nation.

There are fundamental differences, particularly in relation to business cycles, between the enterprises engaged in supplying the day-to-day necessities and the capital equipment enterprises which make the production and distribution of these end products possible. The livelihood of almost every person in the country is directly or indirectly affected.

Durability is one of the outstanding characteristics of products which decline most in demand and production in a depression, regardless of what other factors may have motivated postponement of purchases. This is significant in a study of the decline of the capital goods industries for two principal reasons. First, capital goods are themselves durable and, second, the decline in demand for all durable goods lessens the need for capital equipment to produce durable goods. Figures on durable goods production are not only an index to the decline in capital goods, but they also indicate the decline in derived demand for capital equipment.

Fluctuations in capital goods purchases are closely connected with business purchasing power as contrasted with consumer purchasing power. Leonard P. Ayres estimates that more than 70 per cent of all purchases of durable goods are made by business. The percentage would be even higher in the case of capital equipment in the form of manufacturing and commercial transportation equipment.

Follows Production

The principal effect of sharp fluctuations in demand and production upon national prosperity is felt in the rise and fall of employment which accompanies the fluctuations. Although exactly comparable classifications of industries into durable and non-durable goods groups for production and employment are not available, the United States Bureau of Labor Statistics shows that when industrial employment reached its lowest ebb, in March 1933, the durable goods industries were employing only 47 per cent as many persons as the average for 1923 to 1925. The non-durable goods group, which reached its lowest ebb in the same month, averaged 77 per cent of the 1923 to 1925 average. Payrolls in the same month in the durable goods group dropped to 27 per cent of the

● Always vital is the *precision fabrication* of airplane parts. Yet the Booth precision-cut felts for gyroscope and other aircraft assemblies are held no more rigidly to specifications . . . are die-cut with no finer accuracy . . . than the Booth felt parts utilized in a hundred-and-one industries. ● The secret? Booth-designed precision equipment . . . Booth's long specialization in "prescribing" and supplying the *correct* felt for each industrial job! Write for felt sample chart.

BOOTH FELT COMPANY, INC. • ESTABLISHED 1905 • 431 NINETEENTH ST., BROOKLYN, N. Y.

Booth TRADE MARK PRECISION CUT FELT

1923 to 1925 average, and in the non-durable goods group they were 52 per cent.

It is significant to note that employment in the durable goods industries was maintained at a point far above production due to the general policy of manufacturers to maintain their working forces as nearly normal as possible by paying wages out of surpluses earned in previous years, even though there was insufficient work to be done.

Unemployment and decreased wage payments would have been far more severe had it not been for the surpluses accumulated during years of profitable operation. In the four years of most severe depression, American business paid out 27 billion dollars more than it earned. The durable goods industries paid out far more than their proportionate share, and a large part of it in wages to labor. Successful durable-goods corporations, which have weathered the depressions of the past and continued to be sources of employment and wages, have adapted themselves to these sharp fluctuations. These industries maintained their employment far above production throughout the depression, whereas in the non-durable goods industries production was above employment, almost without exception, throughout the depression.

Activity Essential

One of the most important essentials to economic recovery is increased activity in the durable goods industries, particularly in the capital goods segment. Since there are many commonly overlooked factors in statements of the extent to which these industries have revived and to which they should expand, a few important facts should be considered.

Referring to Federal Reserve Board figures, production of durable goods is still found to be greatly below that of non-durable goods. In April, 1937 it was 92.4 per cent of the 1923 to 1925 average, as compared to 125.4 for the non-durable goods industries.

Employment in non-durable goods industries, according to the United States Bureau of Labor Statistics, rose from 77 per cent of the 1923 to 1925 average in 1932 to 106 in April, 1937, whereas durable goods employment rose from 47 per cent in 1932 to 99 in April, 1937.

In considering durable goods activity, it must be remembered that there has been a period of seven or eight years during which the replacements of durable goods have been almost at a standstill and production could far exceed that of any previous period in history without compensating for the lag. This is in contrast to non-durable or consumption goods, such as food and clothing. Purchases of them were withheld comparatively little during the depression and only a small part of the purchases withheld will ever be made.

In a recent book, "The Recovery Problem," the Brookings Institution reports the results of its calculations of the production requirements for carrying the nation up to the level of production and consumption of 1929. It estimates that this goal cannot be reached until 1941 and that, to attain it, it will be necessary in the durable goods industries to produce at the rate of approximately 33 billion dollars annually from 1937 to 1941. This, the Brookings Institution says, is in comparison with an actual production of about 21 billion dollars in 1936 and an average annual production between 1925 and 1929 of about 25 billion dollars.

HAVE YOU A COPY OF THIS LATEST BULLETIN?

3′ or 4′ Arm
9″ Dia. Column

Write for Bulletin R-21A and see the features that make this High-Speed Super-Service Radial so outstanding in convenience, speed, ease of operation and productivity. Arrange to see one of these machines in operation. To get greater output and to cut overhead rates this machine should be working for you now.

CINCINNATI BICKFORD

Such production, it states, would result in employment of from 8 to 9 million workers for a period of five years.

Thus it may be seen that durable goods activity is far below the height necessary for national prosperity. Here it should be noted again that not only does the durable goods estimate include capital goods, but also that to produce all of these durable goods capital equipment will be necessary.

Purchase of durable goods entails relatively larger expenditures than the purchase of non-durable goods. Usually they are paid for over a number of years, depending upon their length of life. Industrial construction and the purchase of equipment are financed, to a large extent, by new security issues which are retired as the investment returns a profit from use.

Savings Are Essential

In view of a widespread belief that saving is no longer the virtue that it has been held to be over hundreds of years, it is significant to note that the process of saving, by individuals and businesses alike, is the keystone both of individual security and the American system of private enterprise. Only through savings, either in the form of capital or in the form of amortization of extended credit, can facilities be created beyond the buying power available to any individual or group at any one time. Upon this process depends American progress.

Capital equipment essential to the maintenance and advancement of the American standard of living can be acquired only through denial of expenditures for other purposes. Either the money necessary to purchase it must be saved in advance, or the purchase made and earnings from it set aside to retire the debt. This is as fundamental as any law of nature.

An important distinguishing quality of capital goods is that their purpose is to create wealth or to produce an income for their owners and users. Demand for them in times of depression drops not only because those in use can be made to serve longer but also because the opportunity for profits from the purchase and use of new capital facilities is relatively small.

Increasing the amount and improving the quality of the capital equipment, in the form of machinery, placed at the disposal of American workmen probably has done more than any other one thing to raise the American standard of living to its present height.

In a machine shop or a woodworking plant, a lathe increases by many fold the productive ability of the worker and thereby makes it possible for him to earn a larger income. Between 1899 and 1929, according to the United States census of manufacturers, the total amount of machinery, measured in horsepower, used by American manufacturing industries increased more than 300 per cent. To this and the increased production which resulted may be credited the 479 per cent increase in total wages paid by manufacturing industries which took place during this 30-year period. The number of wage earners increased by 88 per cent while population increased 62 per cent, and wages per worker increased 209 per cent.

National experience would indicate that one of the surest methods of increasing the income of an individual or a segment of society is to increase the contribution of that individual or group to the social and

Example 1311-H — Percolator handle die half of Nitralloy for forming Thermoplax cold molded percolator handle. Total production time for both halves of this die was formerly 110 hours. Reduced to 62 hours with 8½D Gorton Duplicator. Actual Duplicator time 20 hours for reproduction from another die.

Is the Die Shop a Bottle Neck?

Die and mold departments easily become bottle necks holding down molding, casting, or forging production for lack of working dies.

Die sinking by the ordinary methods with a block of metal, blueprints, and a milling machine takes an excessive amount of time even for simple patterns.

Gorton Duplicators are speeding up die and mold shops with no loss in accuracy. Send for Booklet 1319B, just printed, showing numerous examples of time saving with Gorton Duplicators on plastic, rubber, glass molds, etc.

GEORGE GORTON MACHINE CO.
1103 13TH ST., RACINE, WIS.

economic system. In most cases that means making the proper capital equipment available as an aid to greater and more valuable performance.

Capital Goods and Prices

There are two important considerations in connection with capital goods and prices. The first is the extent of price fluctuation of the products of these industries and the second is the effect of capital goods upon the general price level, particularly the products of mass production industries.

Statistics on prices are too inadequate to make comparisons between classes of goods. The figures available, consisting mostly of prices of selected commodities more or less typical of the respective classes, indicate that there is generally less fluctuation of prices of durable goods than non-durable goods. One of the principal reasons for the difference is that many durable, particularly capital, goods are made on order to specifications of the purchaser, whereas non-durable goods are standardized and produced in large quantities ahead of expected demand.

The second phase of the relation of capital goods and prices is the effect instruments of production in the capital goods category have upon prices of other commodities. It is fundamental to our economic system that prices be reduced and quality improved as production methods improve, in order that the entire system may profit by the scientific and technological advancements made. Capital goods have contributed to American progress by making possible the production of commodities at much lower costs than would be possible without them.

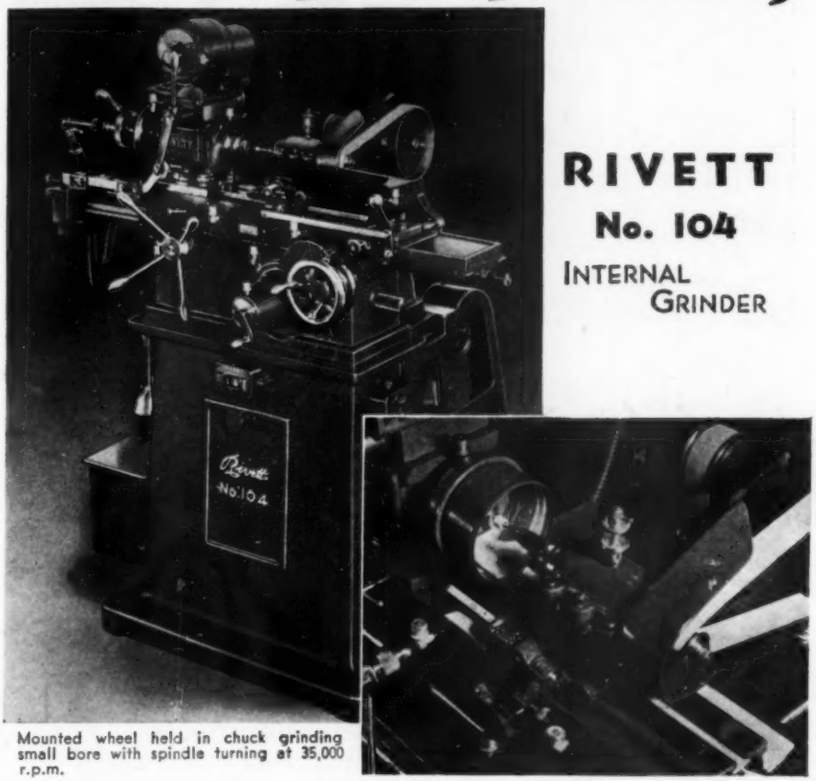
An important factor in this connection is the rise in wages which has taken place when production costs have been reduced. Wages of factory workers have risen much faster than the income of most other major occupational groups. The contrast with agriculture is particularly significant. Approximately the same number of farmers today share a total farm income of about the same size as in the pre-war period, whereas the average factory worker's wage has increased more than 150 per cent on an hourly basis and more than 100 per cent on a weekly basis since 1914. Wage increase to any one group out of proportion to the general rise in incomes of all occupational groups does not spread purchasing power, but rather takes it from the rest of the consuming public. It makes higher prices necessary, or prevents the price reductions which are essential to wide distribution of the benefits of scientific and technological advancement.

Capital goods make their full contribution to national prosperity only when it is possible for their use to spread purchasing power to all consumers in the form of lower prices.

Rapid replacement of goods in use is essential for the advancement of the American standard of living. This is true for two reasons. The first is that only by replacements can the improvements resulting from scientific and technological progress be enjoyed. Although it might have been possible to retain in active use a large proportion of all automobiles manufactured 10 or 15 years ago, such retention would have prevented the enjoyment of improvements which have been developed since that time.

The replacement of capital goods should be speeded up as our physical

Small Hole Grinding



Mounted wheel held in chuck grinding small bore with spindle turning at 35,000 r.p.m.

RIVETT
No. 104
INTERNAL GRINDER

The Rivett No. 104 Grinder is designed to meet demand for a small hole grinder suitable for precision tool making and accurate manufacturing. It may be used as a single purpose machine in efficient production or readily and rapidly set up for the many varying requirements of the toolroom. Correct in proportion and design the extremely high spindle speeds necessary for small hole grinding can be maintained within the required limits absolutely free from vibration.

Although primarily an internal grinder, an external grinding attachment can replace the internal spindle bracket. The Rivett fixed diamond method is used for truing both internal and external wheels. For further information write for bulletin 104-C.

RIVETT LATHE & GRINDER INC.
BRIGHTON, BOSTON, MASS.
PIONEERS IN BENCH LATHE DEVELOPMENT

sciences and mechanical arts develop rather than be slowed down, as only by such replacement can progress in the arts and sciences be put into actual use. As a result of slow replacement following 1929 it is probable that applied science and industrial methods are now further behind perfected inventions and discoveries of the day than ever before in American history.

The second important benefit of replacement of the obsolete is that it creates employment and income which contribute to the advancement of living. It is in the development of new industries and rapid replacement of old products, particularly in the capital goods category, that sources of new employment are found. This is true because the opportunities to increase demand and production of such consumption goods as agricultural products are relatively limited. The potential demand and, therefore, production and employment possibilities, are practically unlimited in connection with such products as automobiles, better houses, business and industrial buildings, capital facilities and many luxury items for personal use which are replaced relatively infrequently.

Expansion Needed

Abundant evidence exists in authentic government statistics to prove that much of America's prosperity in the past, exemplified in employment wages and a generally high standard of living, has been due to the expansion of the nation's durable goods, particularly capital equipment. A large part of the population has gained its livelihood from helping in some manner to expand the total property of this kind in the country. Millions of jobs have resulted from production of goods for the construction of private homes, public buildings and highways, industrial construction, factory machinery and equipment and the like.

It is reasonable to assume that much of the prosperity of the future must depend upon the same kind of business and industrial activity and if durable goods expansion were to cease, if the capital equipment of the country were to remain in substantially its present form and state of repair, there would indeed be grave doubt as to real prosperity ever returning to America.

Geared to Progress

The economic system is geared to progress, not to a static level. It is geared to a growing, expanding system in which the value and serviceability of homes, industries and public properties are increasing, not only in total volume but in per capita volume. This is essential to a rising standard of living. The two are interdependent—neither can be had without the other.

The net result of any factor which deters scientific and technological development in industry is economic waste detrimental to society. Sources of wealth and income change as new forms of capital goods are put into use, and occupations become obsolete, but this does not mean that the net sum of jobs for workers or opportunities for income become less.

Increased production and use of capital goods is an essential to American progress—to more jobs for more workers, and an improved relationship of wages to prices of goods and services necessary to a higher standard of living.

Abstracted from a booklet "Capital Goods and American Progress", published by Machinery and Allied Products Institute, 221 North La Salle St., Chicago Ill.

HAVE YOU TRIED THIS
SPEEDY WAY
OF REMOVING
TENACIOUS DRAWING COMPOUNDS?

DO you want to remove drawing, stamping and spinning compounds more easily? Do you want work to run through smoothly, with more uniform results?

Fast Production at Low Unit Costs

Dependable, just as efficient one day as another, modern OAKITE CLEANING MATERIALS give you ALL these advantages and more. Their powerful, fast action and unique emulsifying properties quickly prepare surfaces for subsequent finishes. Costs too, are surprisingly low. Why not let us give you specific recommendations on your work? There is no obligation . . . write today.

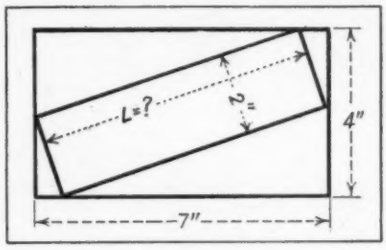
Manufactured only by
OAKITE PRODUCTS, INC., 24 Thames St., New York
Branch Offices and Representatives in All Principal Cities of the U. S.

OAKITE
TRADE MARK REG U.S. PAT OFF.
SPECIALIZED INDUSTRIAL CLEANING MATERIALS & METHODS

How Long Is the Blank?

E. J. SAMPSON

A rectangular blank 2 in. wide is angularly laid out on a rectanguler piece of stock 4 x 7 in. so that each corner of the blank touches a side of the stock. How long is the blank?



What Do the Workers Think?

A. W. FORBES
Forbes & Myers

Let me suggest one method of finding out what the men think, and which was not mentioned by Frank Rising in the article "Unionization" (*AM*—Vol. 81, page 566).

There are some men who will speak their views to anyone anywhere, regardless of consequences. Some of these men are good workers. It should not be difficult to find a man of this type in any organization of reasonable size. After finding the man—one whom we know we will not want to fire—the next step is to start an argument with him.

Make it Brief

As the first argument is merely an introduction, it does not matter what the subject is or how it comes out. What is more important is that it must be brief. Either the boss or the man must have something else to do so that he cannot finish the discussion. But this argument should give the boss the chance to come a day or two later with some printed matter, and to make the remark, "Look this over and let me know what you think of it next time we meet." If other employees happen to be around when they meet, so much the better.

The boss who tries a plan of this kind may be amazed at the amount of information about business, which some of the workers will produce. He may be surprised at the proofs which they can offer. If he does not already know it, he will find that some of the material which employer's associations produce and offer to the workers is actually false, and that it is known to be false by the workers.

Of course, some of the information produced by the workers is also false. One employee told me that now the workers receive only 16 per cent of the money taken in by the employers as a whole, and he proved it by the census. That was too small a proportion. If all wages were doubled and the employers took just as much profit on each article, it would only be necessary to raise prices 16 per cent. Then the workers could buy so much more with double the wages that all business would boom and the employers would make much more profit. If it is all so simple, why cannot the employers see it? Of course, this is an error, but I suspect that most employers would have to do considerable study of business principles in order to point out clearly where the errors are to be found in this statement.

Wherever or whenever the discussions take place, there should be some natural interruption to stop

16" x 8' South Bend Quick Change Gear Underneath Belt Motor Driven Precision Lathe on a manufacturing operation.

THE new 16-inch South Bend Series "T" Lathe, with its double wall apron construction, heat treated headstock spindle, and powerful, quiet underneath belt motor drive is the most popular modern lathe for the manufacturing plant, machine shop, and tool room. The lathe has precision for tool and gauge work, rigidity and power for duplicate manufacturing operations, and versatility for the many jobs in the machine shop. An all-around lathe at a price the smallest shop can afford.

68 Sizes and Types of Lathes for every purpose.

9" lathe prices start at $287
11" lathe prices start at $371
13" lathe prices start at $448
15" lathe prices start at $544
16" lathe prices start at $642

Write FOR BULLETIN

Bulletin No. 16-C illustrates, describes and prices the different models of the 16-inch lathe. Copy sent free, upon request.

SOUTH BEND LATHE WORKS
298 East Madison Street, South Bend, Indiana, U.S.A.

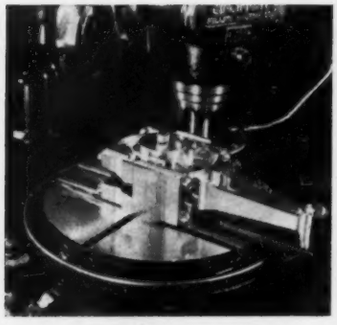
SOUTH BEND *Precision* LATHES
MODERN LATHES FOR MODERN INDUSTRY

them. Five minutes at a time is enough for remarks, but not enough to rouse much heat. It is not time to convince anyone of the errors of his thinking, but he is not going to be convinced anyway. Five minutes at a time is enough for each to show the other his point of view, and to come to some kind of understanding, even though that understanding is merely the agreement to disagree.

And let me suggest one other point. The other employees, who happen to be present, and who may add their word even though not direct partisans, will not hear from this friendly antagonist anything that they will not hear somewhere anyway. In this way they hear both sides at the same time. Most important is to create the feeling that a person can disagree with the boss. Give him a chance to speak his feelings openly where they will be much less harmful than when spoken behind closed doors, and where they will make it easy for the boss to find out the real feelings of the men.

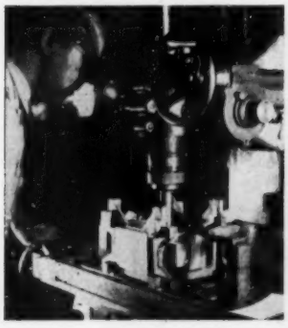
ALL IN THE DAY'S WORK

at TAFT-PEIRCE



MASTER ROD OF AIRCRAFT MOTOR being milled in Manufacturing Dept. Here, high precision parts of all types are turned out "on the button."

LINE BORING a universal crankshaft checking fixture on 1 of 8 horizontal boring mills. No job too small or too large for the Manufacturing Dept.



A FUSSY JOB on one of a battery of jig borers in the Toolroom — equipped and manned to turn out tools, dies, jigs and fixtures.

HIGH SPEED PRECISION DRILLS work on many jobs at once in the Manufacturing Department . . . where parts or complete assemblies are built to your blueprints.

MODERN HEAT TREATING DEPARTMENT — 10,000 sq. ft. of floor space, 100% electric operation, all types of furnaces equipped with automatic temperature control.

THE TAFT-PEIRCE MANUFACTURING CO.

WOONSOCKET, R. I.

Take it to TAFT-PEIRCE for Contract Manufacture, Design, Tooling, Gages, Set-Up and Inspection Tools

NEW BOOKS

FEINMECHANISCHE FERTIGUNG. 36 *pages,* 8¼x11⅝, 112 *pictures and illustrations. Paper bound. Published by VDI-Verlag GMBH, Berlin N.W.* 7, *Dorotheen Str.* 40, *Germany. RM* 3.5. *Written in German.*

Nine papers on the subject of the fabrication of small parts and of fine work presented by members of VDI have been assembled and published in this one booklet printed in German. All phases of the subject are discussed both from the theoretical and the practical viewpoint. Included is a paper on materials and one on procedures and tools for small parts fabrication. Assembly methods, influence of fabrication methods on final construction, influence of construction on costs are subjects of other papers. Graphs of change in costs with change in methods are included. Trade schooling in the art of small parts fabrication is covered in one paper.

The book closes with an extended bibliography of other works on the subject. Articles are profusely illustrated and present a convenient summary of the knowledge available in Germany along the lines of manufacture of small parts not only of steel but of other materials including plastics. Methods of joining materials are discussed.

TRADE PUBLICATIONS

ARC WELDER The "Mutator" arc welder of the electronic-rectifier type is described in Bulletin No. GEA-2447C, by General Electric Co., Schenectady, N. Y. This welder has been designed to provide direct current at low values for welding light-gage metal.

AUTOMOTIVE SAFETY "The Program of the Automotive Safety Foundation," by Paul G. Hoffman, has been prepared in pamphlet form for distribution by the Automotive Safety Foundation, 366 Madison Ave., New York. The Foundation which was organized June 2, 1937 also has a booklet outlining its purpose, function and program.

BEARING APPLIANCES Anti-friction bearings have become widely standardized in dimension as well as in method of application, and now Bulletin B-50 of the R-S Products Corp., 4530 Germantown Ave., Philadelphia, Pa., is presented with

the intention of standardizing other parts involved in the complete assemblies.

BELT HOOKS A folder published by The Eagle Belt Lacer Co., Stratford, Conn., describes and lists prices for Eagle belt hooks that are carded on 12-in. strips and can be used with all standard lacing machines.

CORROSION RESISTANT STEEL A book of illustrations, tables and factual data on typical installations shows how the use of U. S. S. Cor-Ten has eliminated dead-weight. "U. S. S. Cor-Ten—The Low-Cost, High-Strength, Corrosion-Resisting Steel of Many Uses," by the United States Steel Corporation Subsidiaries, 434 Fifth Ave., Pittsburgh, Pa., also includes notes on fabricating technique to be used with the material.

ELECTRIC WELDING Catalog 38W has been prepared by the Eisler Engineering Co., 750 So. 13th St., Newark, N. J., shows sketches and drawings of various types of spot and butt welding. This 100-page catalog contains illustrations, specifications, and descriptions of welders, brazing and soldering machines.

ELECTRODES A. C. type Westinghouse crucible weld electrodes are described and priced in Catalog Section 26-640, published by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

EMPLOYMENT RECORD A supplement to the July 23, 1927, issue of Labor Relations Bulletin of the National Association of Manufacturers presents some brief notes on employment records and offers reproductions of different kinds of these records used by several companies which have given special attention to this phase of employment relations. In some cases two or more forms on the same subject, but showing different methods of treatment, are presented. This pamphlet should be helpful as the recent Supreme Court decision upholding the Wagner Labor Relation Act demonstrates that the employer's employment record must be adequate in respect to competence of the employee, work record of the employee, work habits of the employee, pay record of the employee, and cause of discharge or layoff of the employee.

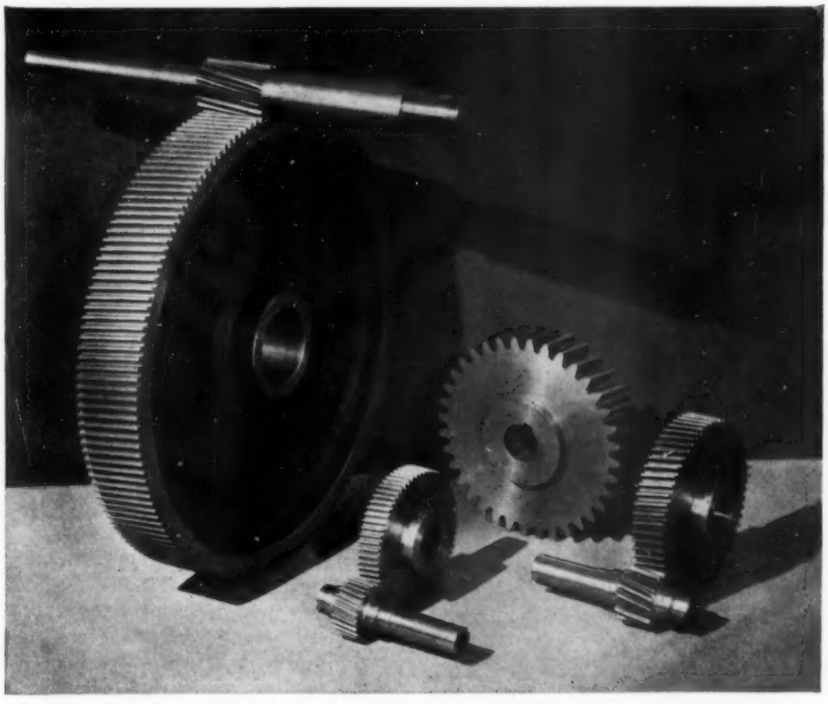
FRICTION CLUTCHES—A 16-page-illustrated list price, catalog No. 1532, has been completed by Link-Belt Co., Chicago, on friction clutches. Besides specifications the book devotes several pages to selection and ordering of the proper clutch.

GRINDERS The complete line of "T" series high speed, heavy duty grinders, including the new model "AT" grinder with wheel wear compensator is illustrated and described in Bulletin No. 837 of Kling Bros. Engineering Works, 1300 N. Kostner Ave., Chicago, Ill.

PIPE AND FITTINGS Haveg Corp., Newark, Del., has prepared a complete data bulletin on its standard size pipe, fittings, valves and fume duct. In addition to giving mechanical details it also includes a table of chemical resistance properties.

POLISHING AND BUFFING The Type "J" automatic polishing and buffing machine, manufactured by Hammond Machinery Builders, Kalamazoo- Mich., is fully described and illustrated in an eight-page bulletin published by the company.

PUMPS A 6-page folder describing the action of the Barnes piston feed pump can now be secured from W. F. and John Barnes Co., Rockford, Ill.



6 PLUS FACTORS

★ Here are a few important features of Horsburgh & Scott Helical gears that benefit every user.

1. The outside diameter, faces, bores and ends of the hubs are smoothly finished to the correct size.
2. The teeth are accurately generated with the correct amount of backlash for quiet, smooth operation.
3. The pitch line is absolutely concentric with the bore.
4. Whether arm or web construction the pattern is chosen not alone for strength but also for pleasing appearance.
5. Rim and arms or web are extra heavy for the pitch.
6. Hub diameters are generously large to allow for reboring and to eliminate the key patch.

Your name on Company Letterhead brings you a Complete Catalog

THE HORSBURGH & SCOTT CO.

GEARS AND SPEED REDUCERS

5112 HAMILTON AVENUE • CLEVELAND, OHIO, U. S. A.

SPEED REDUCING EQUIPMENT Fourteen types of "Ratiomotors" and the same number of types of "Reductors," with a new line of miter gear units and a full line of flexible couplings are listed in a new 98-page catalog (No. 101) of the Boston Gear Works, Inc., North Quincy, Mass. The motorized speed reducers range in ratings from 1/20 to 3 hp., and the reduction ratios of the units range from 3 to 1 up to 5,600 to 1. Applications cover horizontal, vertical, right-angle, parallel, inverted, vertical compound and parallel compound drives. The catalog contains useful data bearing upon speed-reducer selection.

TESTING MACHINES Bulletin No. 131, "Southwark-Emery Testing Machines", has been made available by Baldwin-Southwark Corp., Paschall Post Office, Philadelphia, Pa. Bulletin presents in a very interesting and well-illustrated manner the history of testing machines, mechanical principles involved, types of testing machines in use, and the types manufactured by the company.

Phillips Recessed Head Screws

APEX
SCREW DRIVERS AND BITS

for
PHILLIPS
Recessed Head Screws
(Pat. No. 2046840)
and all kinds of
SLOTTED HEAD SCREWS

APEX-PHILLIPS Hand Screw Drivers and APEX-PHILLIPS Bits for Electric and Air Tools—for all types and sizes of Phillips Recessed Head Screws — are quality tools that will stand the hardest kind of service. They are made of a special shock resisting steel combining the qualities of extreme toughness, wear resistance and hardness.

Substantial stocks of Apex-Phillips Hand and Power Bits, as well as Power Bits for slotted head screws for all types of Electric and Air tools are ready for immediate shipment.

Apex Screw Driver Bits for Phillips Recessed Head or Slotted Head Screws will reduce your screw driving costs. Many of the largest users of screws have proven this.

Write for catalog No. 9—a reference manual of screw driver bits and catalog No. 8 covering Apex Production Tools for Drilling, Tapping, Reaming, Boring, Stud and Nut Setting and Universal Joints.

More than 3000 manufacturers in the United States are users of Apex Tools.

★ THE APEX MACHINE & TOOL CO. ★
Third and Madison Sts., Dayton, Ohio

TESTING MACHINES Research Paper R.P. 1009 on the calibration of testing machines under dynamic loading has been prepared by the National Bureau of Standards. It may be secured from the Superintendent of Documents, Washington, D.C., for 10 cents.

TOOL STEELS A new and revised edition of its pamphlet on cobalt-chromium steel has been issued by Darwin & Milner, Inc., 1260-64 West 4th St., Cleveland, Ohio. Characteristics, heat-treating requirements and methods of handling are described.

VIBRATION A bulletin, "Eliminating Vibration Losses," published by the Korfund Co., Inc., 48-15 32nd St., Long Island City, New York, illustrates the application of Korfund anti-vibration methods to specific installations of machines under various conditions.

WELDING Features, construction and application of the Midget Marvel Flexarc Welder has been described in Catalog Section 26-320 by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

WORKS PROGRESS ADMINISTRATION A "Report on Progress of the Works Program" has been prepared by the Works Progress Administration. A comprehensive survey of the Works Program is presented in this well-illustrated 130-page booklet. It outlines the efforts made to provide security for the unemployed and other groups in need and indicates the setting in which the Works Program has operated. Included is a section on physical accomplishments on WPA Projects which graphically presents the total amount of work accomplished, and the amount of work under way including funds available and funds spent. Several sections are devoted to employment under the Works Program, wage rates and hourly earnings. Included is a report on the program of the National Youth Administration. There is presented a breakdown of the occupations of the workers, shifts in employment, and federal agencies participating in the Works Program. An appendix includes tables which show the number employed in the various agencies, each of the states, number of students receiving aid, number and estimated cost of projects, average monthly wage rates in the various states, and average hours and earnings on WPA Projects by type of project. This is a well printed, well illustrated summary of WPA work under the direction of Harry L. Hopkins, administrator.